THE AEROPLANE and ASTRONAUTICS

JUNE 22, 1961

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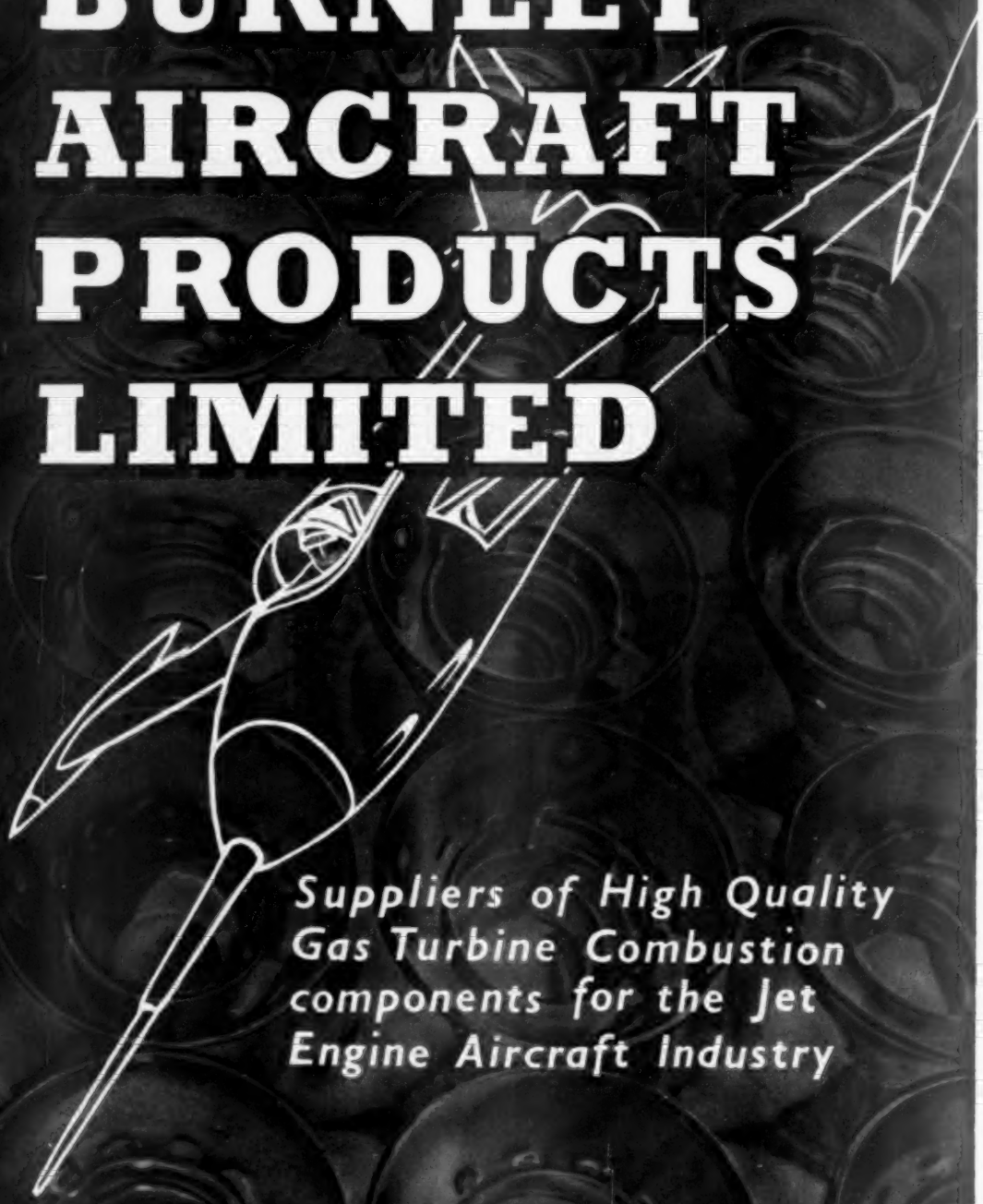

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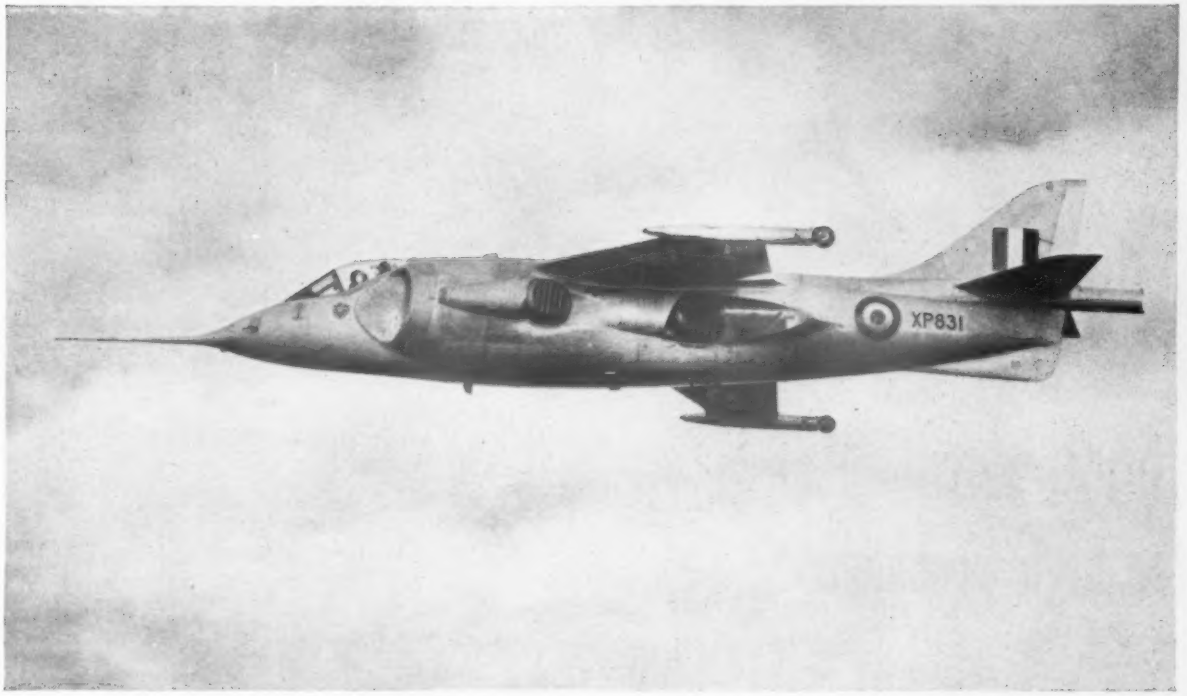

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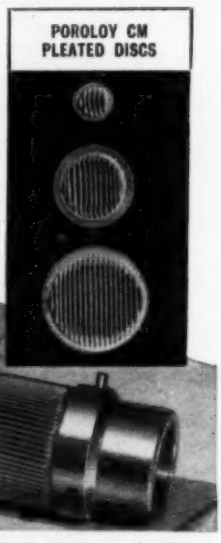

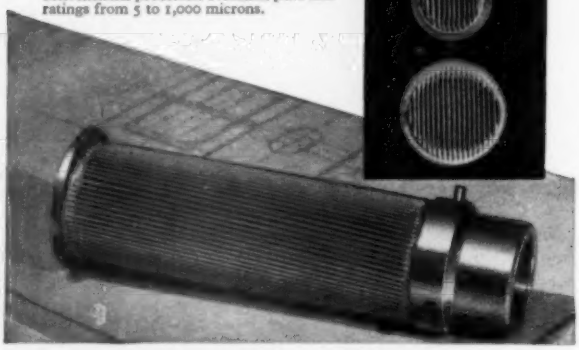

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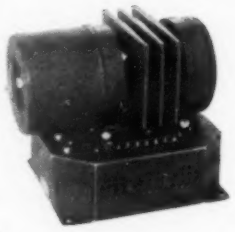

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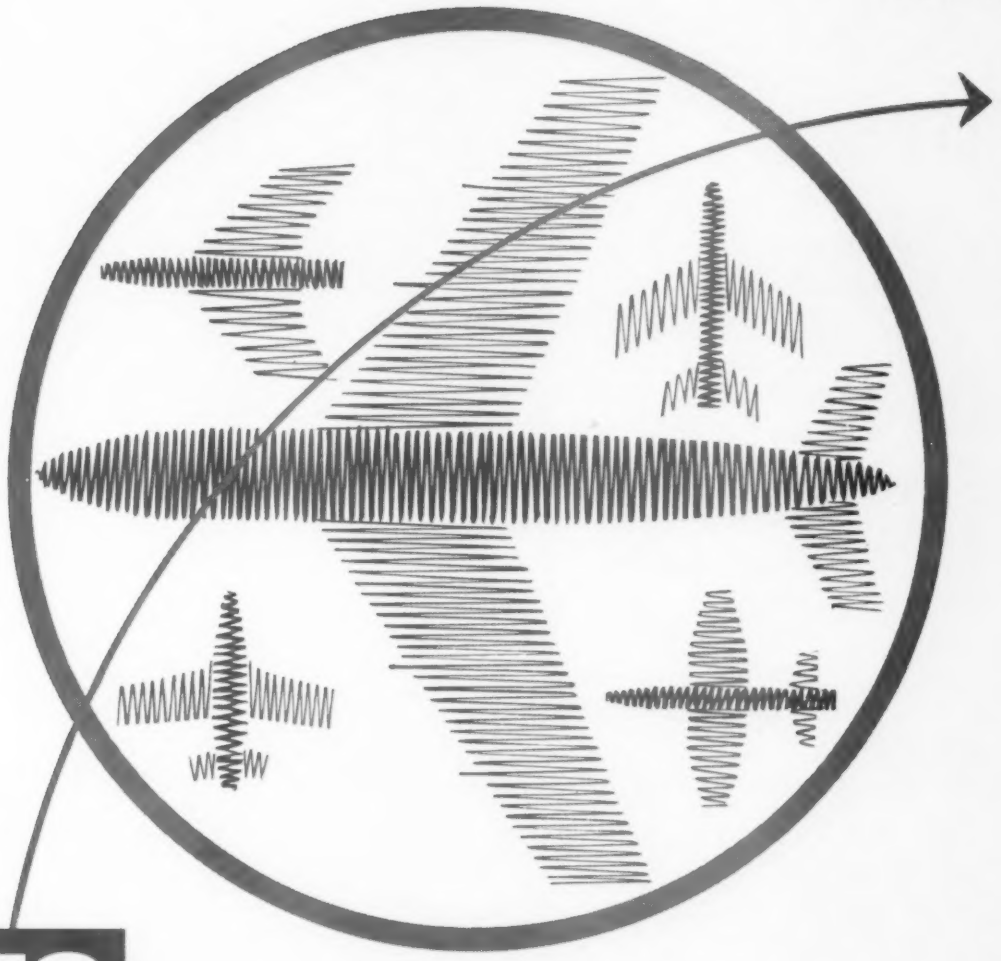

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THE AEROPLANE and ASTRONAUTICS

VOLUME 100 NUMBER 2592 JUNE 22, 1961

Expansions and Control

Inauguration of a new centre for the encouragement of private and business flying, as duly recorded on another page in this issue, makes welcome news indeed. All too often these days come announcements of the closing down of airfields and the facilities they offer. And any reversal of this general process, however modest, is a heartening sign of the times to those who already appreciate the potentialities of light air transport but find that its practical application is restricted because of the lack of proper amenities.

However, with the rapidly growing interest in what has come to be known as general aviation, and the increasing availability of the lighter types of aircraft intended for "executive" use, there is likely to come a concomitant wider interest in the pleasures of flying just for the fun of it. Anything that will help to speed this process is worthy of encouragement, but this brings with it inevitable problems in the need for more, rather than fewer, facilities.

It would be unwise, though, to forecast a sudden mushroom expansion among the light aviation community in the United Kingdom. Growth there will certainly be; but it is more than likely to be of the small and steady kind that hardly makes itself felt until it is almost too late for effective account to be taken of it.

In this context, as a correspondent in this issue points out, one of the most vital problems is that of establishing the right sort of traffic control to accommodate the future needs of light aviation. The ever-present potentially dangerous situations that can arise in the more crowded of our air spaces must obviously be prevented from developing but, at the same time, reasonable freedom to the private and executive aviator must be given. The solution propounded may not be everyone's idea of the ideal; and doubtless many others will be stimulated to offer different ones. The important point is that a problem as pressing as this must be fully aired so that all aspects of it can be examined and the best possible answer be found in the shortest possible time.

Noise and Space

Although traditionally the winter months are taken to be the most appropriate for the lecture season, for obvious reasons, the summer has a very good claim as the best time for the more weighty conferences. Already this year several aeronautical occasions in this category have been organized and news of two more such events, to take place soon, have recently come to hand. One of these is a three-day conference at the National Physical Laboratory covering the vital subject of the control of noise; and the other is a seven-day seminar at Southampton University on various aspects of astronautics.

Although these events have little in common—except in so far as noise and the launching of satellites are inseparable—they both represent particularly important areas of scientific research and development. The first, however, is concerned with a problem that is very much a matter for the immediate present; the second deals with a subject that is a good deal farther away in the time scale.

A solution to the problem of increasing noise generation has become a matter of urgency. Furtherance of knowledge of the new science of astronautics is also essential. Both must be pursued: but future technological achievements will lose much of their value if, in the meantime, environmental noise continues to rise.

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Proprietors - - TEMPLE PRESS LIMITED
Chairman and Managing Director:
ROLAND E. DANGERFIELD

Editorial, Advertisement and Publishing Offices:
BOWLING GREEN LANE, LONDON, E.C.1

Telephone: TERminus 3636
Telegrams: "Pressimus London Telex"
Telex: 23839

Annual Subscription Rate: United Kingdom £4 15 0
Overseas £5 Canada and U.S.A. $15.00

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Matters of Moment

An Appreciation

TO our friends throughout the world of aviation at home and abroad who have sent congratulatory messages and telegrams on the occasion of our Golden Jubilee, we tender our thanks. Their good wishes and encouragement are most warmly appreciated.

Bedfordshire's New Air Centre

AN addition to the British light aviation scene was inaugurated last week-end with the opening of the Bedfordshire Air Centre, at Cranfield aerodrome—home of the College of Aeronautics. It was formally opened by Mr. Peter Masefield, chairman of the Beagle Group; and despite the counter-attraction of the Royal Aeronautical Society's helicopter garden party at Ripley it was attended by a large number of aviation personalities.

Launched with the aim of promoting interest in private and business flying, the Centre will provide flying instruction and refresher courses as well as navigation and radio courses as required. At present the Centre has a fully equipped Cessna 150, an Auster and a Tiger Moth; and a Cessna 172 may also be made available later. Hangar accommodation, an office and a briefing room are rented from the College and catering and other facilities are available.

Although the College of Aeronautics has no direct interest in the Centre, it has certainly done much to encourage it. Indeed, the principal, Prof. A. J. Murphy, and the head of the Department of Flight, Wg. Cdr. G. C. B. McClure, are vice-presidents of the organization. The College's test pilot, Flt. Lt. A. J. McDonald, is its secretary; and one of the Cranfield instructors, Flt. Lt. R. Campbell, D.F.C., A.F.C., is the Centre manager.

Chairman of the Centre's board is Mr. Neville Rogers, an agricultural engineer and farmer, Cessna sales agent for East Anglia, and a most enthusiastic executive aviator. Other members include Major G. Pelham Reid, who took part in the Arch to Arc London-Paris race in 1959; Dr. R. Vaughan; and Mr. C. Allen.

Guests to the ceremonial opening were welcomed by Mr. Rogers, who paid a warm tribute to the College for the encouragement and sympathetic support it had given to the new venture.

Mr. Masefield, in declaring the Centre open, referred to it as an enterprising venture by an enthusiastic team of people. It was, he said, a venture to be commended and was located at a fine aerodrome with excellent air traffic control arrangements and first-class servicing facilities.

Saying that we were at the start of a great upsurge of interest in general aviation, Mr. Masefield suggested that four things needed campaigning for. These were: the provision of more aerodromes and landing grounds; more training facilities; the right sort of aeroplanes, no matter where they came from; and a liberal but responsible approach to the use of air space.

To round off this pleasant occasion a couple of dozen visiting light and medium-size executive aircraft were put through their paces for the edification of the official guests and the entertainment of the many members of the public who had turned up. All of this was done in a delightfully informal "garden party" atmosphere. Indeed, but for the general modernity of the aircraft forming the background to conversation, one could easily have been enjoying a private flying meeting of the mid-'thirties.—F.T.M.

Report From Derby

"A GOOD subject for the application of the doctrine of interdependence," is how Lord Kindersley, chairman of Rolls-Royce, Ltd., describes the aero-engine of today in his annual report published last week. The large sums of money involved in the development of new engines is leading to a reduction throughout the Western World in the number of different designs to meet the same basic specification.

"Nevertheless," Lord Kindersley adds, "the aero-engine industries of the various countries are still seeking to participate in engine projects which will eventually see service with the military forces of their respective countries. This is an understandable trend and one which we are endeavouring to meet by making known our readiness to negotiate agreements for collaboration on a broad basis. I referred last year to the arrangements which had then only recently been made in certain European countries and I have every hope that these and other similar arrangements will continue to operate to the benefit of the parties concerned.

"The 'wind of change' has blown through the British aircraft industry and in recent time we have witnessed important moves towards rationalization. These developments have been in line with Government policy. All concerned for the future of the industry will, I am sure, feel that these moves towards

RALLY AT RIPLEY.—Always a highlight in the rotary-wing calendar, the annual helicoptor rally and garden party of the Royal Aeronautical Society's Rotorcraft Section (the one-time Helicopter Association of Great Britain) at Dunsborough Park was once again a great success. Some two dozen civil and Service machines arrived to be displayed to a large and distinguished gathering of members and guests.

Photographs copyright "The Aeroplane and Astronautics"

TWO OF A KIND.—Refuelling tests have recently been made with Scimitars equipped with the Flight Refuelling Mk. 20 pack. Here the two machines make contact flown by Mr. L. R. Colquhoun and Mr. D. W. Morgan of Vickers-Armstrongs.

rationalization will have been justified if they result in the forging of that closer link between Government and industry which is essential to the future of this particular industry in its dual role of supplier of defence equipment and substantial contributor to exports."

Lord Kindersley goes on to say that Rolls-Royce have been encouraged by the orders placed by B.E.A. and B.O.A.C. But he makes the point that orders such as these alone are not enough to justify the substantial investment that is needed for the launching of new aircraft and engines. "It requires unceasing effort," he comments, "to co-ordinate military and civil requirements and to harness the joint resources of Government and industry in the pursuit of the maximum exports."

Earlier in his report, Lord Kindersley records that during the year under review there was an increase in Rolls-Royce revenue to more than £100 million. Even more encouraging than that, he says, is the increase of the company's exports to £53 million.

Air Matters in Parliament

Blue Streak Again

THE subject of Blue Streak was raised again in the House of Commons on Jne. 5, this time by MR. E. J. ST. L. STRACHEY (Lab., Dundee, W.). He asked the Minister of Aviation at what figure development cost is now running, and suggested that the Minister should now set a time limit on the programme, on the expiration of which, failing a favourable reply from the Federal German Government, the whole project should be scrapped.

MR. PETER THORNEYCROFT replied that the present monthly cost is about £350,000. He expects, he said, a German reply in the near future, as soon as their technical evaluation is complete, and in the meantime he declined to set a limiting date to the undertaking. MR. W. L. WYATT (Lab., Bosworth) found himself in agreement with the Minister, and urged him not to be put off by Mr. Strachey's gloomy approach.

Aerodromes for Executive Use

In reply to MR. P. G. WILLIAMS (Cons., Sunderland S.) Mr. Thorneycroft told the House that the *Air Pilot* now lists no less than 159 aerodromes, including 11 within a 25-mile radius of London, as available for use by business and executive aircraft. The ultimate decision as to the fate of Croydon aerodrome rests with the Minister of Housing and Local Government.

Aviation Exports

Progressive expansion of aviation exports is evident in some telling figures disclosed by MR. GEOFFREY RIPPON, Parliamentary Secretary to the Ministry of Aviation. In answer to MR. D. L. DONNELLY (Lab., Pembroke) he stated that the estimated total value of exports of aircraft, aero-engines, parts and airborne radio and radar equipment in 1960 was £143 million; as against £65.7m., £34.5m. and £4.5m. in 1955, 1950 and 1938 respectively.

NATO Strategy

News of the current review of NATO strategy prompted MR. J. GRIMOND (Lib., Orkney and Shetland) to ask the Minister of Defence on Jne. 7 if he is satisfied that NATO's conventional forces are adequate to ensure that full-scale nuclear war would not be touched off by an accidental or minor incursion. MR. J. PROFUMO, Secretary of State for War, who replied, said that he was so satisfied, and added that one of the purposes of the present appraisal is to ensure that they remain so in changing circumstances.

MR. E. SHINWELL (Lab., Easington) followed by asking the Minister if he would say in what circumstances it would be decided to use the nuclear weapon first. But Mr. Profumo refused to be drawn by this one, emphasizing that it would not be in the best interests of defence to disclose such information to a possible aggressor.

This most interesting colloquy was subsequently rounded off by a nice aphorism from MR. J. W. W. PEYTON (Cons., Yeovil), who remarked that it would be the height of folly, having possessed yourself of a deterrent, to say you would not use it till the event you seek to deter had taken place.

Anti-periphrasis Department

A refreshingly concise and patently truthful reply came from the Minister of Aviation when MR. G. R. CHETWYND (Lab., Stockton-on-Tees) asked him why he approved the large advertisement for whisky immediately in front of the main terminal building at London Airport. Said Mr. Thorneycroft: For money.

O. W. H. COOKE.

To Manage H.S.A. Production

FROM Hawker Siddeley Aviation last week came an announcement of the appointment of Mr. R. A. Courtman, M.I.Prod.E., as the company's production manager. He will be responsible for co-ordinating the production of all the Hawker Siddeley Aviation member companies.

Mr. Courtman is no newcomer to Hawker Siddeley affairs for he has been a member of the Armstrong Whitworth team since 1937. After spending several years in various pre-production departments at Coventry he transferred to the management side of the business in 1944. He was appointed personal assistant to the works director in 1950 and executive assistant to the director and general manager in 1959. The following year he became executive assistant to the managing director and at the beginning of this year was appointed senior executive to the company.

During the latter part of his career at A.W.A., Mr. Courtman played a major part in formulating the production arrangements for the Argosy. He was also in charge of the team which designed and built the company's new beryllium machining plant which was opened last year.

He will be succeeded as A.W.A. senior executive by Mr. G. E. Hayward—a former Armstrong Whitworth apprentice. Mr. Hayward, too, is a production specialist.

Something New from Canada

FROM Canadair of Montreal has come further news of their advanced systems trainer which is being developed there for the radar training of NATO Super Starfighter pilots. Designated CL-41R, this trainer incorporates the same types of electronic equipment to be found in the supersonic F-104G—which was described in some detail in THE AEROPLANE AND ASTRONAUTICS for May 18.

This new aircraft is, in fact, a derivative of the earlier Canadair CL-41 basic jet trainer which has been flying since January of last year. Although this is a subsonic aeroplane its adaptation as a systems trainer for a supersonic type represents good operational economy (direct operating cost will be of the order of $12.4 per hour compared with $112 for the F-104G).

Matters of Moment . . . .

And, clearly, it shows to great advantage on the score of first cost; it has been said, in fact, that the CL-41R is half the price of an advanced trainer and one-third that of a flying classroom type of aircraft.

One important secondary advantage of having a somewhat less sophisticated training aircraft is the important one of ability to operate from small airfields. Moreover, side-by-side seating can be provided to facilitate instruction.

Powered by a 2,570-lb.-thrust Pratt & Whitney JT12 turbojet, the basic CL-41 has a top speed of 475 m.p.h. at 30,000 ft. and can climb to 20,000 ft. in 8 min. The new systems trainer version, which has a weight of 7,870 lb., will have a similar performance; but this can be increased if required by using the 3,000-lb.-thrust military rating of the JT12. This would give it a top speed of 512 m.p.h. and reduce the time to 20,000 ft. to 6 min.

As mentioned earlier certain equipment and components in the CL-41R are interchangeable with those in the Super Starfighter. These include the NASARR radar system; TACAN equipment; UHF radio; the F-104G packaged electronic equipment; and the nose radome and pitot head.

Four-seat Executive Helicopter

FOLLOWING its participation in the Paris Aero Show, a Hiller 12E-4—the new four-seat version of the commercial Hiller 12E helicopter—undertook a series of demonstration flights in the United Kingdom last week. Arranged by the American company's agents in this country, Helicopter Sales, Ltd., and flown by Hiller pilot Frank Huglin, the 12E-4 was put through its paces at Luton, Panshanger, Kidlington, Redhill and at the R.Ae.S. helicopter garden party at Dunsborough Park last week-end.

With the exception of the enlarged canopy (which is a standard 12E component with the addition of a new section), new horizontal stabilizers incorporating anhedral and sweep, and the transfer of the 24V battery to a new location aft of the stabilizers, the 12E-4 is the same as the earlier three-seat 12E. Powered by one 305-b.h.p. Lycoming VO-540-A1B engine which now has dual carburetters as a standard fitment, it has a 10-cu.-ft./125-lb. capacity cargo/luggage compartment and an all-up weight of 2,750 lb.

The U.K.-landed duty-paid price of the basic 12E-4 is £30,500, without radio. The recommended King KY90 transceiver or King KX100 Omni transceiver, are priced at £631 and £906 respectively, and accessories include dual controls for the rear left-hand seat (£615), cabin heater and defroster (£197) and a 20-gal. auxiliary fuel tank priced at £733.

Since production started at the beginning of this year approximately 14 Hiller 12E-4s have been sold in the Americas, together with 17 H23-Fs, the military version of the 12E-4, to the U.S. Army for survey operations. Altogether, over 100 12Es and 12E-4s have now been built.

Canadians Honoured

CANADA'S premier aviation trophy—the McCurdy Award—was presented last month to Mr. J. T. Dyment, F.C.A.I., chief engineer of Trans-Canada Air Lines. Named after the Hon. J. A. D. McCurdy, who enjoys the distinction of being the first British subject to fly a powered aeroplane in the British Empire, the award is made annually for outstanding technical aviation achievement. Mr. Dyment becomes its eighth recipient; he is a graduate of Toronto University (1929) and has been with T.C.A. since 1938. It is largely due to his efforts that the airline's engineering activities have expanded to become one of the major organizations in that particular field.

Another important award presented by the Canadian Aeronautical Institute at its annual general meeting, was that of the F. W. (Casey) Baldwin Award. This went to Dr. E. P. Cockshutt, senior research officer, and Mr. N. Galitzine, deputy section head, both of the engine laboratory of the N.R.C. in Ottawa. They received the award for their joint paper on "The Fan-in-wing Powerplant System for VTOL Aircraft." Mr. Galitzine is a graduate of London University and went to Canada in 1940.

Development of another radical form of aircraft also received due recognition in the third of Canada's principal aviation honours—invitation to give the W. Rupert Turnbull Lecture, which is the premier paper in the C.A.I. calendar. This year it was given by Mr. J. C. M. Frost, A.F.C.A.I., who is chief designer, VTOL, at Avro Aircraft in Toronto. He chose as his subject "The Canadian Contribution to the Ground Cushion Story" and dealt with the history and development of the air-cushion-riding Avrocar. Readers will recall that this craft

FOUR-SEATER.—The spacious cabin of the new four-seat Hiller 12E-4 helicopter, described on this page, shows to advantage in these photographs taken during the demonstration at Redhill. The 12E-4 is powered by a 305-b.h.p. Lycoming and cruises at 90 m.p.h.

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LARGE NEWCOMER.—By the time these words are read, the Aviation Traders A.T.L. 98 Carvair, short- and medium-haul vehicle ferry, is likely to have made its first flight at Southend; here the new aircraft is being made ready for its engine runs and preliminary taxi-ing tests. The Carvair is a converted DC-4 with accommodation for five cars and 23 passengers.

recently made some preliminary runs at Malton Airport, an event which was duly recorded in THE AEROPLANE AND ASTRONAUTICS for May 25.

President of the Canadian Aeronautical Institute for 1961-62 is Air Commodore W. P. Gouin of the National Defence College at Kingston, Ont. In this presidency he succeeds David Boyd, vice-president and general manager of Rolls-Royce of Canada, Ltd.

Yeovilton's Twenty-first

LAST WEEK-END, the Royal Naval Air Station at Yeovilton (H.M.S. "Heron") celebrated its coming of age with an air display and exhibition. The Station was opened on Jne. 1, 1940, when two aircraft belonging to No. 750 Squadron flew in from R.N.A.S. Ford, and it was officially commissioned on Jne. 18, 1940. Since then a number of units have been based there, but more recently Yeovilton has been associated with the specific rôle of training the Fleet Air Arm's night and all-weather squadrons. Initially, the Sea Venom formed the basic equipment, but this has now given way to the Sea Vixen.

During the birthday display low clouds restricted the demonstrations given by the jet aircraft, in particular what was to have been the first formation aerobatics in public by No. 899 Squadron's Sea Vixens. Likewise the seven-aircraft Scimitar aerobatic team of No. 800 Sqn. had to give a "flat" display. At the other end of the speed scale a demonstration of manœuvrability by one of the two remaining Swordfish brought forth a stream of reminiscences from numerous members of the F.A.A. Association who had gathered at Yeovilton for their reunion.

Other items in the flying display included aerobatics by a Spitfire flown by Mr. Jeffrey Quill; a parachute descent by Mr. A. Lang; helicopter displays by Westland Aircraft (Wessex, Gnome-Whirlwind and Belvedere); and a series of fly-pasts from a miscellany of Fleet Air Arm types.

A highlight of the static display was the first appearance of a newly acquired Grumman Martlet, which has been reconditioned to take its place alongside the Swordfish, Seafire and Sea Fury in Yeovilton's historic aircraft collection. At present it is without a sliding canopy, but is otherwise almost complete. Another interesting aircraft which came in for a good deal of examination by the crowd was a Gannet AEW.3 of No. 849 Squadron; of particular note were the "new" under-wing drop-tanks.—P.R.M.

Skybolt Progress

MORE information concerning the Skybolt ALBM was given recently by Dr. Herbert York, Director of Defense Research and Engineering at the Department of Defense. He was replying to questions before the Congressional Appropriations Committee.

Asked for his estimate of when the Skybolt would be ready, Dr. York replied that in his view it could be operational in 1964 or 1965. On the subject of costs, he said there were two—those concerned with research and development and those concerned with procurement. "The development cost is probably in the neigbourhood of $200m. more than we now have in it, in addition to the $200m. that we have so far," he said.

On the question of why the B-70 cannot carry the Skybolt, Dr. York said that the reason was related to the fact that the Skybolt was being designed for use with the B-52. Because the B-52 and B-70 are respectively subsonic and supersonic aircraft, interference due to the installation of the missile was quite different but, more particularly, the problem had to do with launching the missile.

"My guess would be," Dr. York continued, "that the problem of supersonic launching can be solved, but it is not being solved in connection with the Skybolt programme." Quite major modifications would probably be necessary to adapt it to a supersonic aircraft. Although he thought the modifications would be feasible, he said he could not be entirely sure. In any event, the B-70 could slow down to subsonic speed if it proved impossible to launch the missile at higher speeds.

Replying to further questions, Dr. York said it was not necessary to fire Skybolt over its maximum range of 1,000 miles. It could be launched over much shorter distances.

There is no serious doubt, Dr. York concluded, that the Skybolt can be successfully developed. There are doubts about whether it can do precisely what is claimed for it, but there is no serious technical doubt that a Skybolt missile can be built and produced in about the time envisaged. Some doubts about Skybolt have always existed, "but these are not so much on the technical side as they are on the question of how necessary and important Skybolt is in the overall picture of providing a strategic deterrent system."

A Loss to Private Aviation

IT is with great regret that we record the sudden death, on Jne. 11, of Mr. G. H. M. Miles, O.B.E., chairman of the Association of British Aero Clubs and Centres. A great enthusiast for the promotion of private and club flying in this country, he had devoted a great deal of effort for many years to this purpose and was the prime mover behind the formation of the A.B.A.C. in 1946.

Always known throughout the world of light aviation as "Eustace," Mr. Miles had been trained as an aeronautical engineer before he started his aviation career in Imperial Airways. Later he was with the Air Registration Board for a spell, and in 1939 joined the aviation department of Willis, Faber and Dumas, the insurance brokers.

During the War he served in the Technical (E) branch of the Royal Air Force and achieved the rank of group captain. In 1941 he was appointed as Assistant Chief Overseer at the Ministry of Aircraft Production, and he remained in that post until the beginning of 1946 when he returned to Willis, Faber and Dumas. Two years after the founding of the A.B.A.C., he succeeded Mr. Whitney Straight as its chairman. This he remained until 1950. He was again appointed chairman in 1954 and held that post until his death.

Aviation News in General

THREE DAYS ALOFT.—Celebrating 50 years of U.S. naval aviation, a Bell HTL-6 helicopter has been kept airborne for 72 hr. 2 min. by a team of six pilots flying two-hour day and one-hour night shifts. For refuelling and crew changes the HTL-6 was hovered just above the ground. The previous unofficial endurance record of this kind was 57 hr. 50 min. by a U.S. Army team in 1956.

BOEING IN EUROPE.—To further plans for sale and service of its Model 107 helicopter in Europe the Boeing Company has begun the formation of a Swiss company, Boeing-Vertol Europa S.A.

BELGIAN F-104Gs.—For its part in the European F-104G programme Avions Fairey is shortly to complete negotiations for a production programme worth more than £12 million. A joint Avions Fairey/SABCA production line and flight testing facility at Gosselies will be responsible for 194 Super Starfighters.

IMPROVED MOJAVES.—Modifications to 30 Sikorsky H-37 helicopters for the U.S. Army, the first of which has now been delivered, include the installation of automatic stabilization equipment and a redesigned cabin door and cargo hatch.

MORE FOR THE WEHRMACHT.—West Germany has ordered another 90 Sikorsky H-34 Choctaw helicopters at a cost of about £10 million to supplement the 50 already in service with the Wehrmacht. This order is thought to be to fill the gap until production of a helicopter based on the Frelon by Weser, Sud Aviation and Fiat. The 100 TM-76 Mace SSMs on order are to be superseded by the more advanced Pershing combat-range artillery missile.

PORTUGUESE TRANSPORTS.—Six Nord N.2502F Noratlas transports have been ordered by the Portuguese Air Force. They will supplement the six purchased recently from U.A.T.

CROP SPRAYING RESTRICTION.—From Aug. 1, pilots engaged in aerial agricultural operations in Australia will require knowledge of the chemicals used in spraying and dusting. This restriction is being introduced to raise the efficiency of pilots and minimize the danger to stock and foliage. It is estimated that some six million acres will be treated this year by the 62 firms now engaged in aerial agriculture.

MILITARY TRANSPORT.—The Armstrong Whitworth Argosy C.1 made its first public appearance at the Paris Aero Show. The new R.A.F. transport is seen here with its "crocodile" rear supply doors open in flight.

VOODOOS FOR CANADA.—According to Washington reports, arrangements have now been completed for the delivery of 66 McDonnell F-101B Voodoo two-seat all-weather interceptors to the R.C.A.F. In exchange, the Canadian Government will assume responsibility for financing 16 early-warning radar stations in Canada, and will contribute some $50 million towards the cost of about 150 F-104Gs to be built by Canadair for NATO air forces including Greece and Turkey.

TRANSALL ORDER.—Transall have received an order for six more C.160s under the Franco-German co-operation programme. Three prototype and two test C.160s were ordered some time ago. The maximum all-up weight of the C.160 will now be 98,105 lb.

VGSI AT LA GUARDIA. — The R.A.E.-developed visual glide slope indicators will come into use at both ends of La Guardia's 13-31 runway on Jne. 28. This is the first installation completed since the system was adopted by the F.A.A. as a national standard. The equipment is made under licence in the U.S. by Sylvania Electric Products Inc.

A NEW BELL.—U.S. Army is evaluating at Fort Rucker a new variant of the Bell 47 helicopter designated H-13K. Two H-13Ks have been modified from H-13Hs by fitting turbosupercharged Franklin 6VS-335 engines and larger, metal main rotor blades. Since the first YH-13A was delivered in 1946, more than 1,500 military versions of the Model 47 have been produced.

HAWKEYE PROGRESS.—Development testing of the airborne early warning and command electronics carried by the Grumman W2F-1 Hawkeye is now under way. The first aircraft to be so equipped flew for the first time on Apr. 29. The prototype Hawkeye first flew last October.

U.S.A.F. INTERCEPTORS. — The F-101B Voodoo, the F-102A Delta Dagger and F-106A Delta Dart are to be modified under a U.S.A.F.-Hughes modernization programme to give the three interceptors increased overall effectiveness at low altitude and against enemy countermeasures. Five modifications, including the addition of an infra-red search and tracking device, are to be incorporated under the programme.

WRONG V-BOMBER.—In our previous issue we stated that the A.O.C.-in-C., Bomber Command, was flying out to Australia in a Vulcan B.1 of No. 15 Squadron. This unit, of course, is equipped with Victor B.1s.

SET-BACK.—This home-built ultra-light autogyro made by Lieut. Cdr. J. Sproule, R.N. (Retd.), was flown for the first time at Tangmere recently. Unfortunately, it made a heavy landing after an engine cut and the fin and rudder were damaged.

Commercial Aviation Affairs

FRIENDSHIP PURCHASE. — The Mozambique airline D.T.A. has ordered three Fokker F-27s for delivery in August, 1962. The company is the 64th to buy the Friendship and the order brings the total sold to 184.

INDIAN VISCOUNTS.—Indian Airways Corp. is to buy two more second-hand Viscounts from Vickers to increase its total of this type to 12.

PALERMO INAUGURAL.—The first direct service between London and Sicily was opened by B.E.A. on Jne. 15. The service is operated once a week at night tourist rates by Vanguard 953s, the first of which went into service with B.E.A. towards the end of May.

LUXURY SERVICE.—First-class passengers on T.W.A. jet services across the Atlantic now enjoy "Royal Ambassador" service, claimed to be the most lavish ever offered by an airline. Features include fresh flowers in the cabin, porcelain crockery, stem crystal glassware, embossed table linen and napkins, a birthday cake when appropriate, individual photographs taken in flight, participation in the captain's navigation game (with champagne prizes) and one cabin attendant for each 10 passengers. There is no extra charge for this service.

AIRLINE FLEETS.—A new edition of the survey of turbine engine fleets of the World's airlines, published by *Esso Air World*, indicates that nearly 1,800 such transports have now been ordered and more than 1,000 delivered. The survey has been rearranged to list the turbine fleets of each airline alphabetically and shows that 129 airlines have now ordered turbojet or turboprop equipment. It is published by Esso International Inc., Aviation Dept., 60 West 49th St., New York 20, N.Y.

LOS ANGELES TERMINAL.—The first of seven unit terminals which together will comprise the new Los Angeles International Airport terminal facilities is to go into operation on Jne. 29. All seven terminals will be occupied by the end of this year and will eventually be capable of handling 23 million passengers a year.

JET ORDERS.—Orders for three more jet transports have recently been confirmed. They are from Qantas for another Boeing 707-138B with turbofan engines (for a total fleet of 11); from Japan Air Lines for a DC-8 series 50 to replace the aircraft which was damaged beyond repair when it ran off the runway at Tokyo earlier this year; and from Trans-Caribbean for one DC-8 Series 50 next October, with an option on a second.

NORTH STARS PURCHASED.—Overseas Aviation has purchased 15 Canadair North Stars from T.C.A. together with a large quantity of spares. The company has already bought a number of similar Argonauts from B.O.A.C. both for its own use and for resale to other operators.

TRAFFIC RESULTS. — Divisional figures for the 1960-61 financial year show that U.K. airlines offered 27.8% more capacity ton miles on scheduled services and carried 22.2% more traffic. The number of passengers increased by 26.1% and exceeded six million for the first time. The overall revenue load factor fell from 61.1% to 58.6%.

BACK TO EASTLEIGH.—On Jne. 18 Jersey Airlines became the first scheduled operator at Southampton Airport, Eastleigh, since the airport was taken over by J. Nat Somers on May 15. Three flights a week are operated between Eastleigh, Guernsey and Jersey.

RAIL-AIR TO LUXEMBOURG.—Channel Air Bridge, in collaboration with British Railways and Belgian National Railways, is to inaugurate a rail-air-rail service to Luxembourg on Jne. 30. This is an extension of the services already operating from Liverpool Street to destinations in Belgium, with an air link between Southend and Ostend. Three services a day in each direction are available, with 8-hr. journey times.

ALITALIA TO SYDNEY.—Regular service between Rome and Sydney was inaugurated on Jne. 16 by Alitalia. The 11th international airline operating to Australia, Alitalia uses DC-8s on the service which goes by way of Bahrein, Karachi and Bombay.

A.R.B. NEWS.—At the recent Assembly of Presidents of the Air Research Bureau, held in London, the Portuguese airline T.A.P. was accepted into membership, which now totals 15 European companies. The Bureau is to set up an Air Transport Management Course for its member airlines and others.

U.A.R.—U.K. TALKS.—Negotiations between the United Arab Republic and the United Kingdom to finalize a reciprocal air agreement will be resumed on Jly. 17 in Cairo. One of the points at issue is the U.A.R. request for traffic rights between London and New York.

News About People

CONTINUING AS CHAIRMAN.—Lord Douglas of Kirtleside, whose present term as chairman of B.E.A. is due to expire next April, has accepted an invitation from the Minister of Aviation to continue in this position until Dec. 23, 1963, when he will be 70.

AER LINGUS APPOINTMENT.—Mr. William W. Whelan, former Aer Lingus district manager for London, has been appointed administrative manager, Britain. He has been with Aer Lingus since 1946.

SILVER CITY CHANGES. — Mr. Leslie McCracken has been appointed to the newly created post of general traffic manager of Silver City Airways. He was previously commercial manager. Other new appointments are of Mr. Leslie R. Pavey to be general sales manager and of Mr. C. John Barron to be commercial superintendent.

PUBLICITY CHIEF.—Group publicity manager of Kelvin and Hughes, Ltd., for the past 18 years, Mr. R. Bagot has joined Scientific Publicity, Ltd., as chairman and managing director.

ADEN RETIREMENT.—Capt. H. W. C. Alger, who has been general manager of Aden Airways for the past four years, retired at the end of May. He began his career with Imperial Airways in 1928 after flying with the R.A.F. for five years. He is succeeded in Aden by Mr. D. F. Classey who joined B.O.A.C. in 1946, was in Hong Kong from 1947 until 1959 since when he has been secretary and commercial manager of Aden Airways.

SYWELL DEVELOPMENTS. — Mr. H. M. Newton has been elected a director of Sywell Aerodrome, Ltd., in the place of the late Lt.-Col. G. R. D. Shaw and has also been appointed general manager of the company which operates Northampton Airport, Sywell. Mr. Newton has recently returned from Pakistan where he has been Aviation Sales Manager for Burmah-Shell.

SEACAT REPRESENTATIVE. — Captain E. A. Good has joined Short Bros. and Harland, Ltd., to be technical representative in Australia and New Zealand for the Seacat SAM which is to be adopted by the navies of both these countries. He is based in Sydney.

DIRECTORSHIP.—Mr. R. F. G. Lee, deputy chairman and joint managing director of CIBA (A.R.L.), Ltd., has been made a director of CIBA Clayton, Ltd.

AIRLINE INTEREST. — Visiting Short Bros. and Harland Mr. Sigurd Wien, (right), President of Wien Alaska Airlines is here inspecting a Skyvan skin panel with Mr. F. H. Robertson (chief engineer) and Mr. J. Stead (production manager).

Air Transport

West Indies Problems

THE future and form of the successor to British West Indian Airways—when Federation independence finally comes about on May 31 next year—still appears to be very much a matter of argument. The report of the Tymms Commission was issued six months or more ago; this report has not been made public, but the fact that there have, so far, been no signs of action on its recommendations suggests that these have not been agreed by the various factions concerned.

Apparently the report recommended, as was to be expected, that the Federation should have its own airline, with the present B.W.I.A. forming its nucleus, and also that B.O.A.C. and Trans-Canada Airlines should be minority shareholders in an organization which would be primarily a Federation Government undertaking. The main unresolved problems appear to revolve around the question of the extent to which the airline could reasonably be able to operate autonomous long-haul international services outside the Caribbean area.

According to *Aviation Week* the Commission proposed, among other things, that the reorganized airline should order a minimum fleet of four medium-range turbojet aircraft in the D.H. 121 or Boeing 727 category for operations primarily to and from points outside the Federation. Additionally three (later four) Avro 748s, Fokker F-27s or H.P. Heralds should be ordered for more immediate use on the inter-island routes. The Viscount 702/772s (possibly converted to a 58-seat layout) would be retained for use on the trunk Caribbean services and those to Miami until the turbojets went into service. Interim arrangements would be made with B.O.A.C. and T.C.A. for the operation of the Jamaica-New York and Trinidad-New York services for which the West Indies will retain traffic rights.

A twice-weekly service to London should be operated by the airline if the Federation considered that the prestige value was worth an annual subsidy which was likely to amount to more than £350,000. Alternative and less expensive suggestions for the operation of these services were that B.O.A.C. 707-420s should be chartered; that B.O.A.C. should operate them in the Federation airline's colours but at its own expense; or that one 707-420 should be bought and integrated, for maintenance purposes, in the B.O.A.C. fleet.

The corporation has invested something like £5½ million in the existing airline and has absorbed substantial losses. In the 1959-60 financial year a loss of £618,335 was recorded against B.W.I.A. in the corporation's accounts.

Meanwhile, a U.S. delegation, headed by Mr. Ernest Lister, assistant chief of the State Department's civil aviation division, came to London last week for talks about the future of air routes and traffic rights in the Caribbean following West Indian independence. Rights held by B.O.A.C. probably will have to be reassigned to B.W.I.A. as the national carrier.

A Short-haul Transport System

A "SYSTEM" approach to short-haul transportation is called for, according to Mr. William P. Kennedy of the Lockheed Aircraft Corporation,* if a big step forward is to be made in this category of air travel.

Several groups will be involved in working out an overall solution to the problem of reducing elapsed time on city-centre to city-centre journeys over ranges of up to about 300 miles. Architectural engineering, control and communication equipment design, airport engineering and aircraft ("air vehicle") design are all involved. Greater integration is needed between surface transport systems and air transport, in order to shorten the passengers' walk between vehicles.

The aircraft most suitable for short-haul operation is expected to be a VTOL vehicle "at some point in the future." In a comparison between two 50-passenger vehicles, one with two turbofans requiring 5,000-ft. runways and the other a multi-engine VTOL type, the latter was found to have a higher first cost, affecting depreciation and insurance costs; higher fuel costs because of the greater thrust required in landing and take-off operations; and higher engine maintenance costs because of the greater number of engines. There was some saving in flight time because most manoeuvring requirements in the air and on the ground at the beginning and end of the flight were eliminated.

Because of its much greater convenience, the VTOL aircraft should be acceptable at moderately increased operating costs (about 30% at 150 miles). The question really rests with the community, which should adapt its airport and terminal facilities to obtain maximum benefits from VTOL machines.

Mr. Kennedy makes the interesting suggestion that an airport building might be provided with a series of loading platforms, one under the other, allocated for private cars and taxis, hire cars and buses, and rapid transit trains. The VTOL aircraft, having landed alongside this building, could then be delivered (mechanically) to each platform in turn to allow quick and easy transfer of passengers to the desired surface vehicle. Such a scheme has the advantage of keeping the terminal building compact and minimizes the area of ground required.

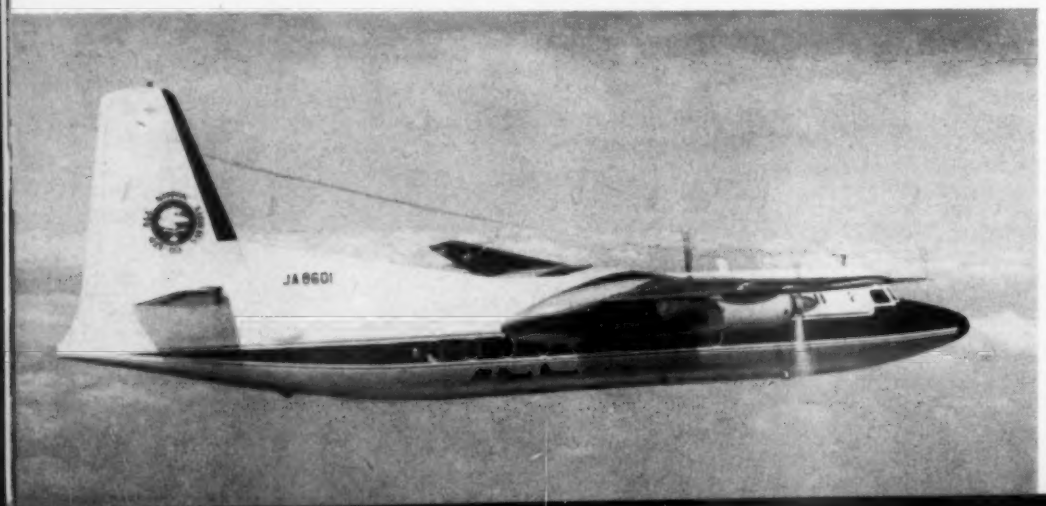
Although the design of a suitable VTOL aircraft for operation into and out of large cities with all-weather regularity is difficult, some of the other problems in providing a wholly integrated system and a suitable terminal may be even more difficult. The author looks forward to the time when a large city—striving to promote commercial activity in the central metropolitan area—sets up a working committee, including the surface transportation agency, an architectural/engineering firm, the airline or airlines concerned, and an aerospace firm with systems design and systems management experience.

*In a paper "Short Haul Air Transportation" given last week at the joint meeting of the I.A.S. and A.R.S. in Los Angeles.

Investigating the Sonic Boom

THE Federal Aviation Agency, NASA and the U.S.A.F. will next month begin a co-ordinated study of the sonic boom phenomenon, using for tests the B-58 Hustler and the F-104, -105 and -106 supersonic fighters.

The study will be divided into four specific projects: Sonic boom generation and propagation; design considerations and operational procedures to minimize the intensity of the sound; and boom effects.



JAPAN-BOUND.—After its appearance at the Paris Aero Show early this month, the first of six Fokker F-27 Friendship Series 200s was delivered to All Nippon Airways in Japan, where it will go into service on Jly 10. Two days later, All Nippon will inaugurate its first external service, between Japan and Okinawa, using F-27s.

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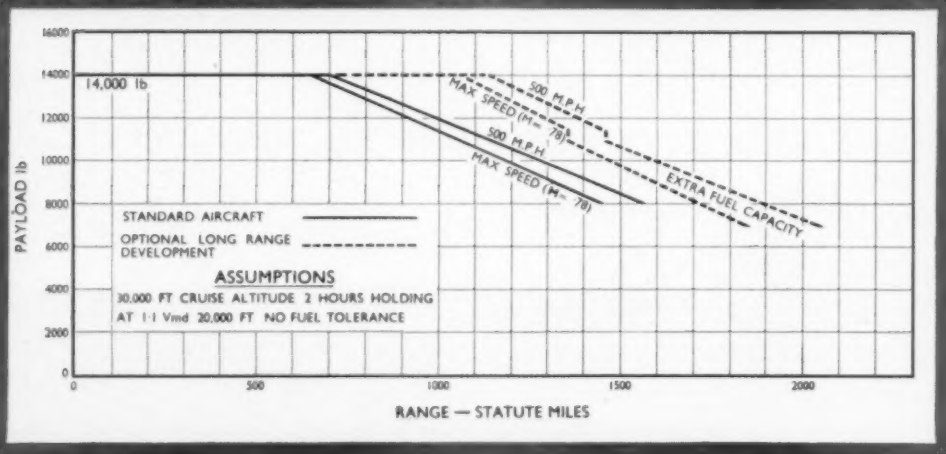
BRITISH UNITED AIRWAYS HAS CHOSEN THE OPTIONAL LONG RANGE DEVELOPMENT OF THE STANDARD AIRCRAFT

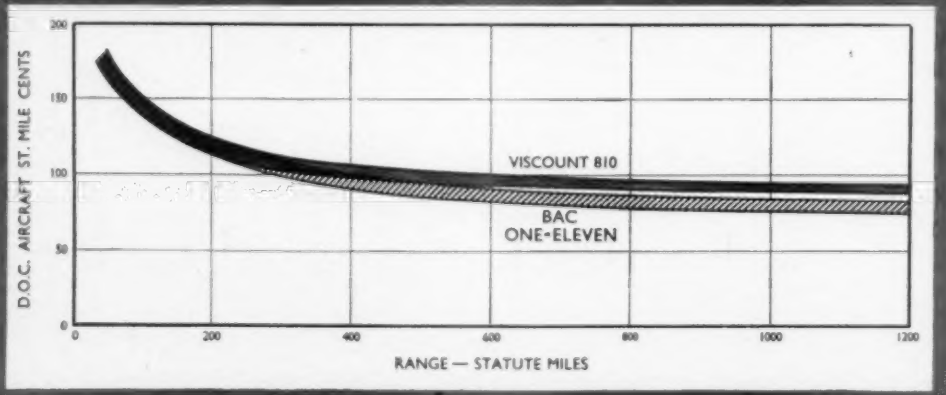
The BAC One-Eleven can carry its full complement of 57 mixed class passengers and baggage at 500 mph for stages of 1,070 statute miles with two hours reserves. It can carry 43 passengers for 1,500 miles

PAYLOAD v. RANGE



ECONOMICS

These bands cover seven separate methods of costing —ATA (1955), ATA (1960), SBAC and those of four airlines



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Air Transport . . . .

The D.H.126 Short-Hauler

NO decision has yet been taken to proceed with construction of the de Havilland D.H.126, an ultra-short-haul feeder-liner and "suburban air bus" project. First mentioned in our issue for Feb. 3, the D.H.126 is one of a family of rear-engined airliners designed by de Havilland, of which the D.H.121 Trident and D.H.125 Jet Dragon are already in production. With two turbofan engines, the D.H.126 would be designed to carry 30-50 passengers over sector distances of up to 600 miles. In size it would thus fall between the executive Jet Dragon and the British Aircraft Corporation's One-Eleven (see pp. 725-6 of this issue).

Market research and design work on the project have been going on for the past two years and "great interest" has been reported from a number of airlines. The decision whether to proceed depends to some extent on the question of Government help—in principle the project appears to be of a kind which could qualify for this. Although it would probably not have any structure common to the Trident or Jet Dragon, the D.H.126 would take advantage of de Havilland's now considerable knowledge of jet airliner design and the extensive wind-tunnel testing of tail-end jets which has already been done. Both the development costs and the first cost of the aircraft might therefore be kept within a reasonable limit. Engine projects—all turbofans—by Rolls-Royce, Bristol Siddeley and de Havilland are all being considered.

Specific interest in the D.H.126 was mentioned last week by the deputy general manager of United Arab Airlines, Mr. Hussein Tewfik. "Our technical experts," he said, "are most excited about its prospects." The company might want about seven, and would hope that they could go into regular service in the Middle East late in 1964.

Decline and Short-Fall

BOTH B.E.A. and B.O.A.C., within the last week or two, have blamed conditions in America for falling load factors on their services. In both cases, the fact that fewer Americans are travelling this year is said to account for a set-back in the growth rate which hitherto had been achieved for some time.

The B.E.A. traffic results for April, for instance (see table) show that the increase in total traffic over April, 1960, was a modest 8%, whereas 20% more capacity was being offered. The revenue load factor consequently fell by nearly 10% (6.6 percentage points). The fact that Easter fell in April last year, but in March this year accounted in part for the small increase in traffic, but the position in general is a matter of concern for the corporation, coming as it does in a year in which a large part of the introductory costs of the Vanguard and Argosy must be borne.

On its scheduled services in to and out of the U.K., B.O.A.C. has been reporting weekly load factors 10 to 15 percentage points below those achieved at the same time last year. This is almost wholly the result of the situation on routes to and through the U.S.A.

Compared with last year, nearly 50% more seats are being offered on these routes following the full introduction of the Boeing 707 fleet. Business, however, has increased on these routes by only 10%. B.O.A.C. says this is partly because Americans are not travelling so much, because of the trade recession, but also results from pressure being exerted upon Americans to use their own airlines, and also from increasing competition by "small carriers who have big jets."

The "fly American" movement has its basis in America's balance of payment crisis last year, and although not official Administration policy is supported at lower Government levels by some officials. It was one of the subjects discussed by Mr. Erroll, Minister of State at the Board of Trade, on a recent visit to Washington.

B.E.A. TRAFFIC RESULTS—APRIL 1961

	April 1961	April 1960	Variation
Capacity ton miles offered ..	22,023,000	18,321,000	+20.2%
Load ton miles sold	13,208,000	12,198,000	+ 8.3%
Revenue load factor	60.0%	66.6%	− 9.9%
Passengers carried	340,908	313,037	+ 8.9%
Passenger miles flown	120,252,000	110,546,000	+ 8.8%
Passenger load factor	61.9%	66.8%	− 7.3%
Freight ton miles	1,412,100	1,303,000	+ 8.4%
Mail ton miles	297,300	320,200	− 7.2%
Aircraft miles flown	3,321,300	3,260,300	+ 1.9%
Revenue hours flown	15,322	16,000	− 4.2%

That Near Miss

THE Ministry investigation into the near-collision (or "air-miss" as these incidents are officially known) on Feb. 21 near Epsom, involving a United Arab Airliners' Comet 4 and a Trans-Canada Airlines' DC-8, has shown that the DC-8 was the aircraft at fault. The T.C.A. crew, after leaving London Airport, had been cleared to 4,000 ft. by A.T.C. but, "owing to a misunderstanding in the cockpit," the DC-8 continued to climb and passed through the 5,000-ft. level allocated to the Comet, which was inbound from Zurich.

The statement from the Ministry of Aviation does not explain the nature of this "misunderstanding" (about which other sources of information questioned by us also remain silent), but makes the following comment:

"The Canadian Department of Transport is satisfied, on the information provided to it, that if an error was made by the pilot of the aircraft it was the result of cockpit procedures employed by the airline rather than one of negligent omission or by the pilot. It is the Commission Department of Transport's intention, therefore, to ensure that the cockpit procedure currently employed on all such aircraft used by Canadian airlines remain under active examination to ensure that maximum safety procedures are employed and maintained."

The Ministry adds that measures have been instituted by T.C.A. to eliminate the possibility of a recurrence of this kind of incident and that the circumstances are being brought to the attention of other operators and pilots.

AIRPORT PRIME MOVER.—Now undergoing tests at Dulles International is the prototype mobile lounge, the massive size of which can be appreciated for the first time in these pictures. Driven from either end, it is used to convey passengers between terminal building and aircraft and takes the place of fingers, ramps and aero-gangplanks.

Air Transport . . . .

More Facts about Aeroflot

ONE or two meagre, but nevertheless useful, facts and figures about Aeroflot are given in the ICAO annual report.

Apparently official sources announced during last year the approximate number of passengers carried on the Russian airline's domestic and international services during 1959. The total was 20 million and the figure was described as showing a gain of 50% over the 1958 total and as being equivalent to the number of passengers carried by the airline between the years 1950 and 1955.

The Aeroflot passenger total is, of course, very much the highest figure for any individual airline in the World, but should, realistically, be compared with those for other countries rather than for other individual airlines. The U.S. air passenger total, on domestic-trunk, local and international services, was 55,875,000 in 1959 and the Aeroflot figure for that year is approximately equivalent to the U.S. total for 1950. So far as individual airlines are concerned, the U.S. domestic "big four"—American, Eastern, United and T.W.A.—carried between them a total of 30,747,000 passengers in 1959.

The recent expansion in Aeroflot traffic has been attributed partly to a reduction of 20% in domestic fares and partly to the introduction of turbine-powered aircraft. A very large increase in traffic has been reported, for instance, on the Moscow-Leningrad Tu-104B service, which handled 250,000 passengers in the year up to April, 1960—a fivefold increase on the previous annual total.

Aeroflot has now embarked on a re-equipment programme aimed at the replacement of all piston-engined aircraft on the medium-distance routes. In due course Tu-104B turbojets and Il-18 (plus a few Tu-114) turboprops will be used exclusively on trunk services, and Tu-124 46-passenger turbofans and An-24 turboprops will be used on all medium-distance routes.

Problems for S.A.A.

FOLLOWING South Africa's withdrawal from the Commonwealth, and consequent political isolation—a Cape Town correspondent writes—speculation is now rife as to the possibilities of other African states "getting tough" and denying landing facilities or airspace to South African Airways.

The denial of landing facilities would not be so serious as the denial of airspace. The S.A.A. Boeing 707s are capable of flying non-stop from Johannesburg to Rome with a full load now that the main runway at Jan Smuts Airport has been extended to 14,500 ft.

The Minister of Transport recently admitted, when seeking approval for unauthorized expenditure of £315,000 on the airport, that the runway extensions were dictated by threats from other African states. Another remarkable admission was that, by "cutting across normal procedure," the department had completed the extension in the record time of 15 weeks. If the department had kept to the prescribed forms of calling for tenders, the work would have taken two years.

Although the runway extension might well make non-stop flights practicable, South African Airways must still worry about alternate fields on the way to Europe in the event of mechanical trouble while airborne.

Denial of airspace could conceivably lead to an S.A.A. aircraft being forced down if the airline chose to ignore such a ban. It would not help much to appeal to the International Court—particularly if South Africa had by then withdrawn from the United Nations (as is now being forecast) and, *ipso facto*, from the International Civil Aviation Organization. Rather more subtle attacks may be possible.

This, our correspondent adds, is putting the blackest interpretation on recent developments. South Africa's withdrawal from the Commonwealth is not likely to affect pool arrangements with B.O.A.C., Central African Airways, East African Airways and Qantas on the various international and regional routes; these are, like that with Portuguese East Africa's DETA, bilateral agreements.

Nevertheless, these are some of the facts that may need to be faced in the years to come by South African Airways if it is not to become a victim of the country's racial policies.

Belfast Variants

THREE versions of the SC.5 Belfast freighter have now been indicated by Short Bros. and Harland. They are distinguished by series numbers as follows:

SC.5/10. The version ordered by R.A.F. Transport Command and now in production at Belfast. Powered by four 5,730 e.h.p. Rolls-Royce Tyne R.Ty.12s (16 ft. diameter propellers), it has a gross weight of 220,000 lb. and a maximum payload of 85,000 lb. Rear loading doors. Max. speed at full weight, 347 m.p.h. Balanced field length, 6,900 ft.

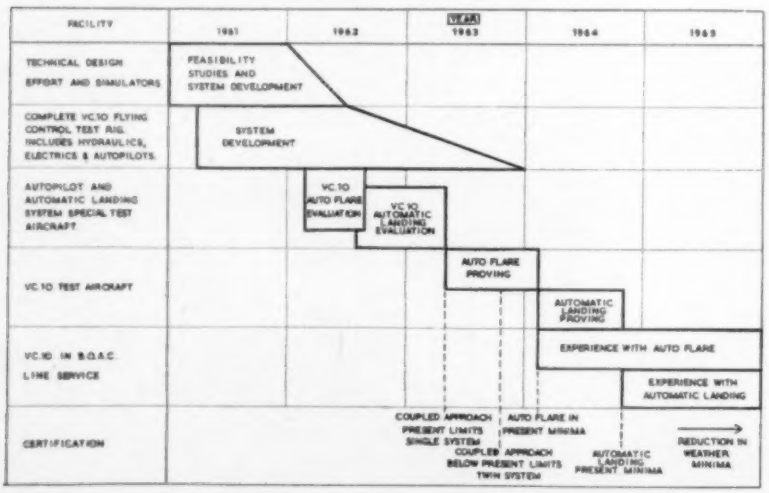
SC.5/20. A heavy tactical freighter proposal, in which the more powerful Tyne Stage 5 engines (20 ft. diameter propellers) are used to obtain better take-off performance. Gross weight 220,000 lb., max. payload, 80,000 lb., max. speed, 395 m.p.h., take-off distance to 50 ft., 3,300 ft.

SC.5/31. This is the recently announced swing-nose, two-deck civil transport project (see our issue for May 11, p. 508). In this variant, advantage is taken of the added power of the Tyne Stage 5 to increase the gross weight to 300,000 lb. and the maximum payload to 100,000 lb. Maximum speed is 373 m.p.h. and balanced field length, 8,600 ft.

VC10 Autoland Programme

AS illustrated in the accompanying chart, the development and certification of the automatic landing capability of the Vickers VC10 are planned to be completed for present weather minima requirements by the last quarter of 1964. This will then lead to the building up of airline route experience with automatic landing to achieve the final object of the programme —the certification of full automatic landing for considerably reduced weather minima.

The VC10 automatic landing facility forms part of the aircraft's overall flight control system being developed by Elliott Brothers (London), Ltd. The responsibility of the company's Transport Aircraft Controls Division, the VC10 system incorporates Bendix PB-20 autopilot components and techniques, together with a number of new features designed by Elliotts. Amongst these are the dual autopilot concept and the automatic change over between these self-monitored autopilots to



In this chart the major steps in the development and certification of the VC10 automatic landing facility are shown against a time scale. As described on this and the next page, the major portion of the technical design has already been completed.

enable the system to meet the A.R.B. reliability requirement that it should not cause an accident liable to involve a fatality in fewer than 10 million landings.

At the present time the feasibility studies and the major portion of the VC10 automatic flight system, including simulator checks, have been completed. The system is now to be incorporated in a completely representative flying control set-up for the aircraft. This overall system, which also includes the aircraft's hydraulics and those parts of its electrical system applicable to the flying controls, is being set up in a test rig at Weybridge so that ground development and fault checking can be completed.

In addition to this development work in a test rig, which will continue until the end of 1963, the complete VC10 dual autopilot and automatic landing system is planned to be installed in a special test aircraft (type unspecified). Starting next year, this aircraft will initially be employed on auto-flare evaluation before progressing on to full automatic landing trials. These are due to be completed in the first half of 1963 when auto-flare proving with a VC10 test aircraft is to begin.

In the first phase of trials, ILS coupled approaches with a single autopilot will be made, down to present weather limits, followed by coupled approaches below present limits with the dual system. These trials will provide the basis for the certification of the dual autopilot installation for normal airline coupled approach and auto-flare use to present minima. Once this certification has been obtained, experience with auto-flare with VC10s in B.O.A.C. line service is expected to start early in 1964.

Full automatic landing proving trials with the test VC10 are also planned to start in the spring of 1964, continuing through to the autumn of that year with the progressive certification of the various features of the complete system. B.O.A.C. should be able to start building up en route automatic landing experience down to the present weather minima before the turn of that year. The certification of automatic landing for progressively lowering minima will be possible as operational experience is obtained during 1965 and onwards.

High Utilizations in Australia

ONE of the useful and interesting documents issued by the Australian Department of Civil Aviation is the Aviation Studies Branch breakdown of airline utilization statistics. No doubt the authorities in other countries work out similar records, but, if so, they are not made generally available.

This time the figures cover the calendar year 1960 and show, in general, even higher utilizations than those recorded in the previous records—which were for the year ended Jne. 30, 1959. Once again an extraordinary feature of the tabulations is the very high all-round level of utilization even for short-medium-haul aircraft.

The highest figures are for the Lockheed Electras used by Ansett/A.N.A. and Trans-Australia Airlines. Operating over a similar period and with similar fleet strengths for the type, Ansett's L-188s averaged 3,768 hr. on scheduled services only and T.A.A.'s averaged 3,634 hr. These hourages compare with a top figure, in the previous annual returns, of 3,876 hr. for Ansett's DC-6Bs.

More surprising are the utilizations of the Fokker F-27s—with an average of 3,098 hr. for those operated by Ansett. This carrier's DC-3 freighters (fleet strength of two during the year) put in an average of 3,072 hr. each.

The 1960 statistics include an all-in breakdown for the total fleet of the Ansett Transport Industries Group (Ansett/A.N.A., Airlines of N.S.W., Airlines of S.A., and Queensland Airlines). This shows that 52 aircraft in service during the year (excluding a Short Sandringham and a Catalina, whose inevitably low hourages were out of line with the normal averages) put in a total of 110,674 hr. on scheduled operations—an overall average of 2,128 hr. per annum per aircraft. On a similar basis, T.A.A.'s fleet of 37.6 working aircraft flew 79,562 hr.—or a remarkably similar average of 2,111 hr. per aircraft. The mean stage distances flown on the various services of the two groups of operators varied between 78 and 670 miles and the mean block speeds between 122 m.p.h. (Douglas DC-3) and 304 m.p.h. (Lockheed Electra).

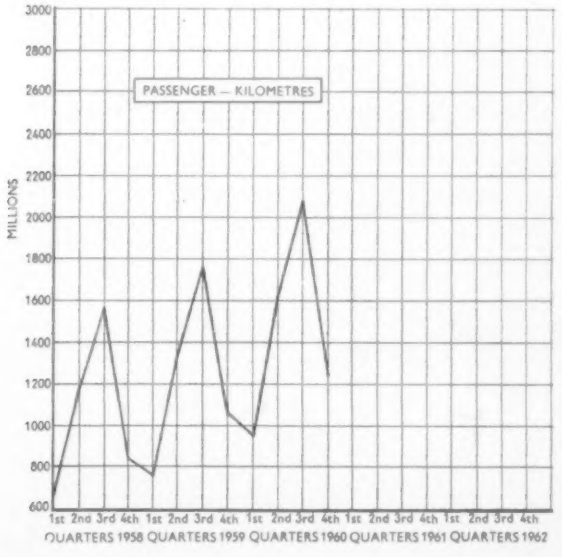
European Traffic Trends

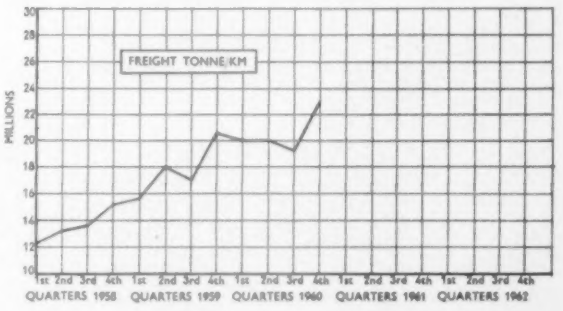
DURING 1960, passenger traffic on international intra-European services increased by 19%, and by the end of the year one-third of all passengers were flying on jet aircraft. Operations by freight aircraft increased by about 50% and about a quarter of intra-European air freight now moves on all-freight aircraft. These statistics are given by the Air Research Bureau, and relate to the 12 major European airlines.

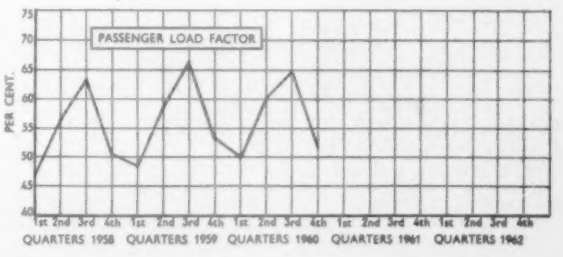
Statistics for the fourth quarter of 1960 are tabulated (right), and the quarterly trends are shown on the three graphs. The growth rate in the last quarter, at 18%, was two points better than in the third quarter, but the passenger load factor declined because of a 23% increase in seat-miles offered. Freight tonne/km., at 23 million, were an all-time record but the increase for the quarter, at 11%, was well below the rate of growth for 1960 as a whole, at 15%.

	4th Qtr.		1960 as % of 1959	12 mths. ending		1960 as % of 1959
	1959	1960		Dec. 1959	Dec. 1960	
Seat/km. (million) ..	1943	2391	123	8460	10140	120
Pass./km. (million) ..	1046	1236	118	4924	5871	119
Pass. load factor % ..	53.8	51.7	—	58.2	57.9	—
Freight tonne/km.(mill.)	20.6	23.0	111	71.3	81.9	115
Mail tonne/km. (mill.)..	5.1	5.3	105	16.7	17.9	107

Intra-European traffic includes all traffic carried on international routes originating and terminating within the European continent and countries bordering the Mediterranean. Airlines included in this survey are: Aer Lingus, Air France, Alitalia, BEA, Finnair, Iberia, Icelandair, KLM, Lufthansa, SAS, Sabena and Swissair.





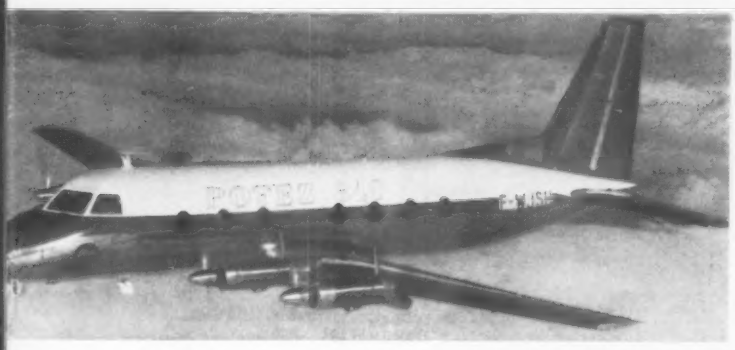


Above, at a recent "breakfast flight" meeting, organized by the Ontario County Flying Club of Oshawa, no fewer than 250 aircraft participated and 900 pilots, passengers and friends turned up for breakfast.

Right, Marshal of the Royal Air Force Lord Tedder, president of the R.A.F.A., addresses the Association's annual conference, held in Douglas, Isle of Man on Jne. 3-4; on his right is the Mayor of Douglas, Alderman Quirk. A report of the conference is on page 724.

Above, Bullpup air-to-ground missiles are shortly to go into service with the U.S.A.F. on F-100 Super Sabres and tests have also been made with these missiles on an F-105 Thunderchief. Bullpup was originally developed for the U.S.N.

Below, the first visit of the Gazelle-powered Wessex the Westland heliport at Battersea was on May 26; it taking the Australian Minister of Defence, Mr. A. Townley to Portsmouth.



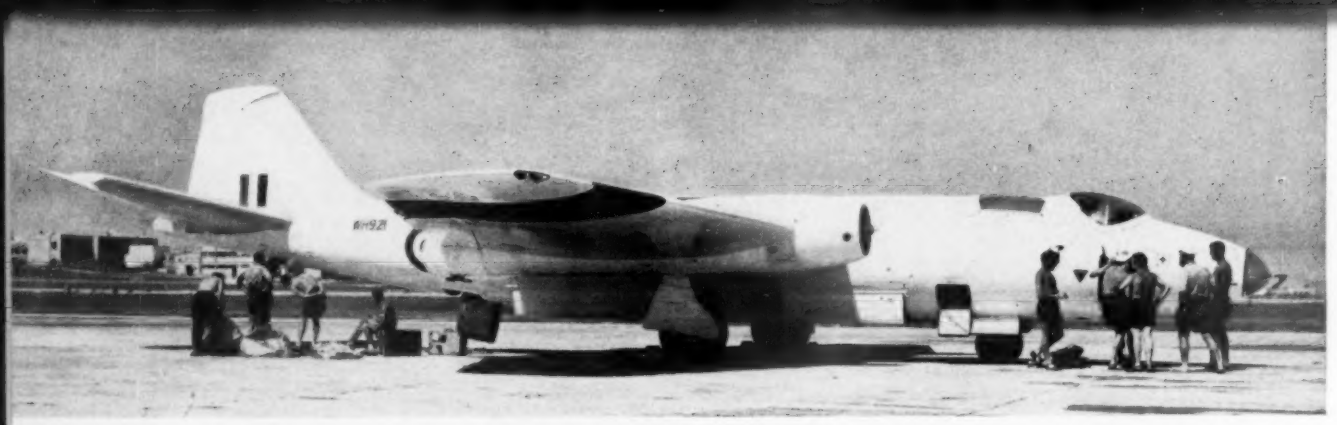
Left, this first air-to-air photograph of the new Potez 840 turboprop-powered feeder-liner shows to advantage its well-balanced lines.

Below, a visitor to Gatwick last week was this Morava L200A; it has been making a series of demonstration flights to commemorate the tenth anniversary of the inauguration of Czechoslovak Airlines' aero-taxi services.

AIRCRAFT AND OCCASIONS

Left, a new anti-submarine warning version of the Grumman SA-16B Albatross. Sixteen of these aircraft are being produced by modifying ex-U.S.A.F. craft for delivery to the Royal Norwegian Air Force under the military assistance programme.

Below, one of two English Electric Lightnings from Boscombe Down that have been shipped to Aden for hot-weather trials. The aircraft were sent by sea instead of being flown to Aden because, according to the Ministry of Aviation, facilities at certain aerodromes en route were not suitable.



SEASLUG TARGET.—A recent addition to No. 728B Squadron at R.N.A.S. Hal Far, Malta, is this Canberra U.10 pilotless target drone. To be used in the Seaslug SAM trials from H.M.S. "Girdle Ness" later this year, the U.10 was flown out by Lieut. R. G. Bruce, R.N.

The Fighting Services

Senior Technical Appointments

THE new A.O.C. and Commandant of the R.A.F. Technical College, Henlow, is to be Air Cdre. J. C. Pope, C.B.E. He will follow Air Cdre. N. C. S. Rutter, who is to become Senior Technical Staff Officer at Headquarters, Bomber Command, in August, with the rank of Air Vice-Marshal.

At present S.T.S.O. at Headquarters, Flying Training Command, Air Cdre. Pope will take up his new appointment at the end of July. Air Cdre. Rutter became A.O.C. of Henlow in 1958, before which he was at the, then, Ministry of Supply directing the research and development programme of the V-bomber force.

R.A.F.A. Conference in Douglas

THE annual conference of the R.A.F.A. was held on Jne. 3 and 4 at Douglas, Isle of Man. Homes for the sick—particularly the chronically sick—was an important item on a full and comprehensive agenda.

Following the Ceremonial Entry of the Association Standard and the Silent Tribute, conducted by the Rev. R. S. Meadows, R.A.F. Chaplain, His Worship the Mayor of Douglas, Alderman T. A. Quirk, J.P., welcomed the National Council and delegates. In paying special appreciation for the presence of Marshal of the R.A.F. The Lord Tedder, G.C.B., D.C.L., LL.D., the Mayor pointed out that it is always the busiest man who can still find time to take on voluntary work.

Lord Tedder, President of the Association—who received a tremendous ovation—apologized for being "unserviceable" for the 1960 Conference and declared that he was now "airworthy" after his "forced landing." He read a message from Her Majesty The Queen sending best wishes for the success of the Conference and thanking the Association for their loyal greeting; messages were also received from The Duchess of Gloucester and from H.R.H. The Duke of Edinburgh.

In proposing that the Association should invite Marshal of the Royal Air Force Sir Dermot Boyle, G.C.B., K.C.V.O., K.B.E., A.F.C., to become a Life Vice-President, Lord Tedder said that to realize that a Cranwell cadet had retired from the Service made him—and his contemporaries—appreciate their own ages. He felt the time had come for the "young air marshals" to play a part. The proposal was warmly supported.

In presenting the annual report, the chairman of the council, Air Marshal Sir Harold Lydford, K.B.E., C.B., A.F.C., said that new members were being accepted at the rate of about 1,000 a month and he appealed to delegates to return to their branches determined that existing members should not be allowed to drift away.

Representing almost 7,000 overseas members were delegates from Belgium, the Netherlands, India, Bermuda, Israel, Malta, Kenya, Jamaica, Pretoria, Switzerland, France, the U.S.A. (two members of the San Francisco branch), Dublin and Jersey. On their behalf Mr. W. K. R. Laysell, from Belgium, asked that the word "National" be deleted from the headquarters title.

Air Marshal Sir Robert Saundby, K.C.B., K.B.E., M.C., D.F.C., A.F.C., D.L., urged branches to make a success of the new combined Battle of Britain Souvenir Book—a joint effort in conjunction with the R.A.F. Benevolent Fund and the R.A.F.

As usual, Conference had its lighter moments—once when Sir Harold Lydford reported that a Government department had stated that "good fellowship" could not be interpreted as "a charitable object," which necessitated the removal of these two words from the Association's Royal Charter. Later, in discussing a delegate's "deploring" the "meagre" contribution from Headquarters to the McIndoe Memorial Fund, Mr. C. J. Hill (Welsh Area Representative) explained that he had consulted his dictionary about "meagre"—had found it meant "niggardly," that "niggardly" in turn led to "sordidly parsimonious" and that upon looking-up "parsimonious" it said . . . "see niggardly"; his commentary on these interpretations dissolving Conference into laughter.

The Association's general secretary, Mr. Gerald Boak, and his colleagues, ably supported by the hard-working members of the Douglas Branch, deserve the warmest congratulations for a smooth-running occasion.—L.H.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments.

Air Ministry: Gp. Capt. J. A. Crockett, Wg. Cdr. W. A. M. Oram, and Sqn. Off. M. F. Gunnill, W.R.A.F., with acting rank of Wg. Off., to the Department of the Air Member for Personnel.

Bomber Command: Wg. Cdr. D. Bower, O.B.E., A.F.C., to R.A.F. Lindholme to command, with acting rank of Gp. Capt.; Wg. Cdr. C. C. Calder, D.S.O., D.F.C., and Sqn. Ldr. C. A. Wade, with acting rank of Wg. Cdr., to Headquarters for Air Staff duties and administrative plans duties respectively.

Flying Training Command: Wg. Cdr. J. R. Forsythe, D.F.C., to the R.A.F. Flying College, Manby, for instructional staff duties.

Technical Training Command: Sqn. Ldr. R. G. Neate to No. 7 School of Recruit Training, Bridgnorth, to command the Administrative Wing, with acting rank of Wg. Cdr.

Maintenance Command: Wg. Cdr. F. W. Morgan, M.B.E., to No. 30 Maintenance Unit, Sealand, to command, with acting rank of Gp. Capt.

R.A.F. Germany: Wg. Cdr. R. J. E. Boulding to Headquarters (Unit) to command; Sqn. Ldr. D. Duncan to Headquarters for engineering duties with acting rank of Wg. Cdr.

Far East Air Force: Wg. Cdr. C. F. Price, R.A.F. Regiment, to Headquarters as Senior Ground Defence Staff Officer.

Other Appointments: Gp. Capt. J. E. S. Hill, D.S.O., to Headquarters, Air University, Maxwell Air Force Base, U.S.A., as R.A.F. Adviser to the Commandant and R.A.F. Liaison Officer; Sqn. Ldr. F. W. Doherty to command R. Malayan A.F., Kuala Lumpur, with acting rank of Wg. Cdr.

More Service News

Million Up.—Operating from R.A.A.F. Butterworth, No. 52 Squadron (Sqn. Ldr. G. Moss) has now dropped over one million lb. of supplies to troops engaged in security duties in the Malayan jungle. The millionth pound—a gift of canned beer from No. 55 Company, R.A.S.C.—was recently flown out to members of the 1st Royal Australian Regiment operating in North Malaya. Prior to moving to Butterworth in October, 1960, No. 52 Squadron was based at Changi, Singapore, and Kuala Lumpur.

Expedition Turbulent.—Following their graduation from No. 8 F.T.S. at R.A.F. Swinderby, 14 students are undertaking a series of flights round the coast of the British Isles in a Turbulent. Making 22 "hops," the aircraft is being supported by five servicing teams travelling by road in cars containing the necessary maintenance and refuelling equipment.

R.A.A.F. Lincolns Grounded.—The era of four-piston-engined bombers in the R.A.A.F. ended on Jne. 14 with the flight of an Australian-built long-nosed maritime reconnaissance Lincoln from Townsville to Darwin. Following a 45-min. farewell flight over R.A.A.F. Townsville the previous day, the aircraft, together with six other Lincolns, has now been grounded.

No. 601 Squadron.—Following its annual reunion dinner last month, the No. 601 Squadron Old Comrades Association is looking forward to a very special occasion which is expected to be arranged in the autumn, the laying-up of the Squadron Standard in St. Clement Danes Church. Any former members of No. 601 Squadron who are unaware of the existence of the Association can obtain full details from the Hon. Sec., Mr. W. J. Kentish, 35 Floriston Court, Whitton Avenue West, Northolt Park, Middlesex.

The BAC One-Eleven Described

A LITTLE more information about the structural design and equipment of the BAC One-Eleven short-haul jet transport has been made available. From this it is clear that the aeroplane has been designed to take advantage of advanced structural techniques, and is to be equipped to modern "big-jet" airliner standards. The slightly smaller BAC 107, to follow a year or so later, has been described as being "less sophisticated" than the One-Eleven, and this apparently refers particularly to simplification of the systems.

The structural design philosophy for both aircraft is basically one of low stress levels and fail-safe or multi-load paths. The main wing torsion box is constructed of integrally machined combination skin-stringer panels built around three shear webs to form a twin torsion box.

Throughout the fuselage both frames and stringers are continuous. The frames are channel section, and cleated to the skin and support z-section stringers which are flush-riveted to the skin. The whole structure is made from widely available and proven moderate-strength copper-based aluminium alloys. Use is made of integral machining techniques developed within British Aircraft Corporation and adopted for the Vanguard and VC10.

The flying controls are manually operated by cables and are designed with duplication in the systems providing control about all three axes. Main control surfaces are of conventional form, being aerodynamically balanced and operated by spring tabs. An adjustable-incidence tailplane is incorporated for longitudinal trimming and is hydraulically controlled. Lateral control is by normal ailerons assisted by spoilers, which are actuated by the hydraulic system and are also used as air brakes when required.

Hydraulically operated three-piece Fowler flaps are fitted to each wing. The design of the flap system incorporates safety devices to guard against asymmetry under all conditions. The main control surfaces are locked for parking by lever-operated mechanical locks; and with controls locked it is not possible to run up more than one engine at a time to take-off r.p.m.

Fuel is carried in an integral tank in each wing, the maximum fuel capacity being 2,250 Imp. gallons. Both tanks are fitted with capacitance-type contents gauges. Underwing level indicators are fitted which allow the fuel contents of each tank to be checked on the ground.

In normal operation there is an entirely separate fuel system for each engine, fuel being supplied from each wing tank to the engine on the same side. A cross-feed is incorporated whereby fuel in both wings can be used to supply a single engine; alternatively both engines can be supplied from one wing tank. A pressure fuelling/defuelling system is provided and also overwing (gravity) fuelling positions. Complete fuelling can be achieved in less than eight minutes, using the pressure system.

For airframe anti-icing, hot air tapped from the compressor stages of the engine is used to heat the wing leading-edges, the fin and tailplane and the engine intakes.

Systems Engineering

The basic philosophy of the systems design for the One-Eleven has been to incorporate proven principles and components with the widest airborne experience in airline service. All major systems are fully duplicated with close integration for maximum efficiency, reliability and full stand-by provision for all essential operations to ensure that no single failure will endanger the aircraft safety.

In this duplication of major systems, each half system acts as emergency stand-by for the essential services of the other. In normal operation both halves are in continuous operation.

Two completely independent 3,000-p.s.i. hydraulic systems with their own reservoirs are provided, and power from one or the other operates the landing gear, wing flaps, spoiler/airbrakes, tailplane trim, nosewheel steering, ventral stairs and wheel brakes. One system incorporates an electrically driven hydraulic pump which will maintain pressure in the system in the event of the engine-driven pump failing.

Emergency undercarriage lowering is achieved by "free fall" following mechanical release of the uplocks. The flaps are operated by duplicated hydraulic motors; should one hydraulic system fail, full flap operation is still obtained. The hydraulic system is designed to operate on Skydrol 500A.

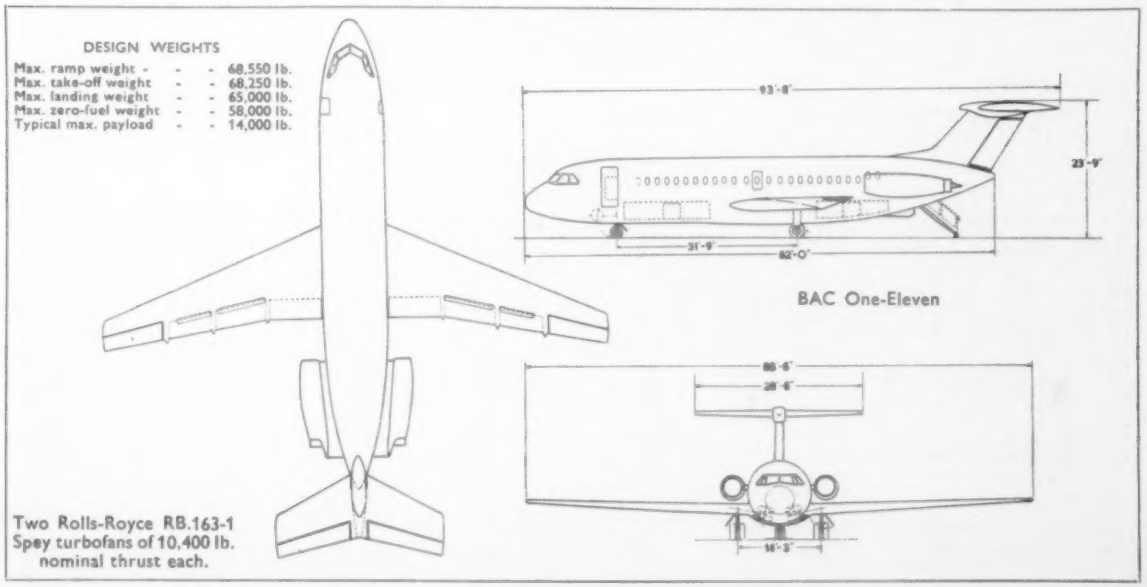
The basic electrical generating system consists of two constant-speed drive units, driving 30 kVA brushless generators which in turn supply two individual AC load bus-bars. Electrical services to both bus-bars can be maintained with one generator inoperative. Two 100-ampere silicon transformer-rectifier units are provided, one fed from each AC load bus-bar. The DC outputs are connected to a common DC bus-bar.

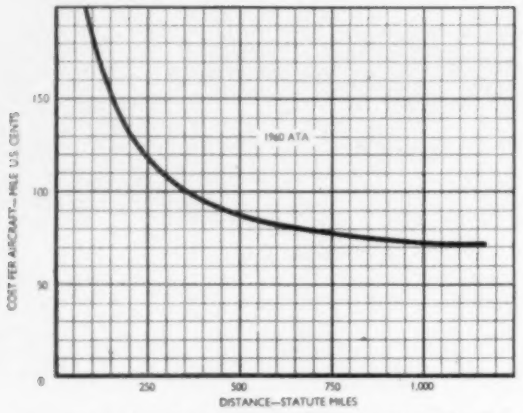
Passenger Accommodation

With its 54-ft.-long constant-section cabin, the One-Eleven provides for a wide variety of cabin arrangements, the 124-in. width at elbow level being sufficient for five-abreast seating with 19-20 in. per passenger. Passenger amenities and bulkheads are track-mounted to permit a variety of two-class arrangements, a typical "mix" being 28 four-abreast at 38-in. pitch forward and 29 five-abreast at 36-in. pitch aft. The elliptical windows measure 14 in. by 9 in. and have a 20-in. pitch.

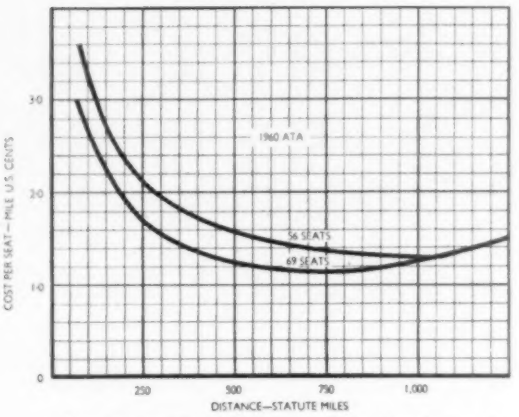
Separate access to fore and aft cabins is provided, both doors having built-in airstairs. The doors are plug type, outward opening on parallel linkages similar to those of the VC10.

Maximum cabin differential pressure is 7 p.s.i. (8,000 ft. at


DESIGN WEIGHTS
Max. ramp weight - - - 68,550 lb.
Max. take-off weight - - 68,250 lb.
Max. landing weight - - 65,000 lb.
Max. zero-fuel weight - - 58,000 lb.
Typical max. payload - - 14,000 lb.
93'-8"
23'-9"
31'-9"
82'-0"
BAC One-Eleven
Two Rolls-Royce RB.163-1 Spey turbofans of 10,400 lb. nominal thrust each.



Direct aircraft-mile costs, calculated to the 1960 A.T.A. formula.



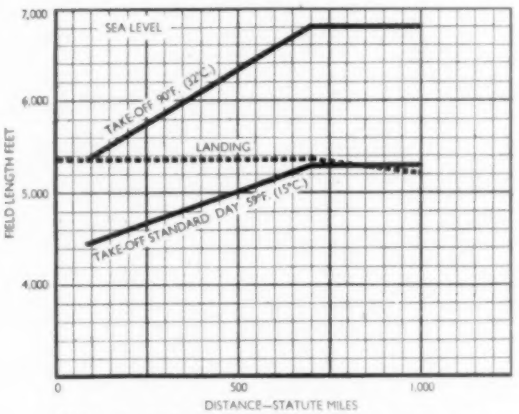
Seat-mile costs of two versions of the One-Eleven are slightly lower than those of the Viscount under comparable conditions.

32,000 ft.). With the exception of the nose cone, centre-section bay, undercarriage bays and tail cone, the whole fuselage is pressurized. The air supply is derived from tappings on the engine high-pressure compressor.

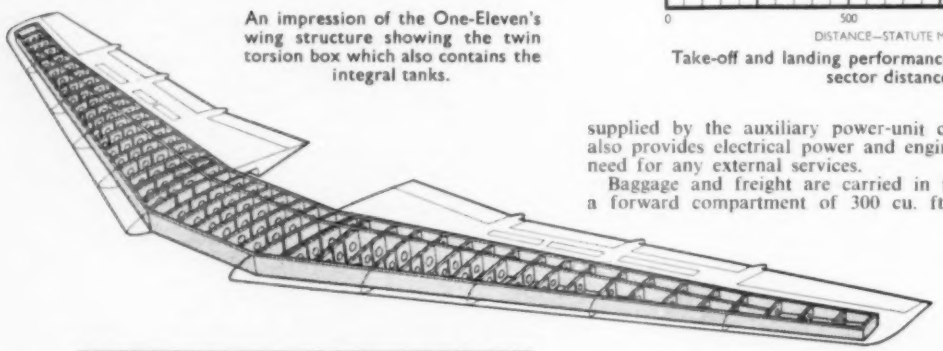
Temperature control in the cabin is provided by "mixing" high temperature air from the engine compressors with air from a refrigeration circuit. Conditioned air is supplied to wall distribution ducts and then fed to the cabin below the luggage racks. Flight deck and cabin supplies are ducted separately and a special control is provided to permit the flight deck temperature to be varied from that of the passenger cabin.

Twin or triple individual air outlets are provided over each standard seat row on each side of the cabin. These are fed by a separately ducted cool air supply. Full cooling is achieved by routeing the air through the refrigeration system. Warm air is obtained by by-passing the refrigeration components.

The air-conditioning system can be operated on the ground with main engines stopped, or when taxi-ing or idling, by air supplied by the auxiliary power-unit compressor. This unit also provides electrical power and engine starting without the need for any external services.

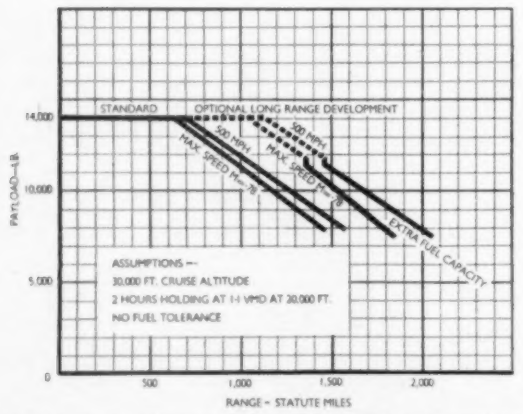


Take-off and landing performance plotted for various sector distances.



An impression of the One-Eleven's wing structure showing the twin torsion box which also contains the integral tanks.

Baggage and freight are carried in two under-floor holds, a forward compartment of 300 cu. ft. capacity and a rear hold of 200 cu. ft. These are loaded through doors on the starboard side of the fuselage, the front door being 2 ft. 7 in. high by 3 ft. 6in. wide and the rear door being 3 ft. 3½ in. high by 3 ft. 6 in. wide. The sills of these doors are 3 ft. 4 in. and 4 ft. respectively above ground level. Baggage may, therefore, be loaded through doors of convenient size which are close enough to the ground to make special baggage handling equipment unnecessary.



Payload-range performance of the One-Eleven in its standard and long-range versions, the latter with additional fuel in the centre section.

Performance

The curves reproduced here give a broad indication of the One-Eleven's performance. Of particular interest is the payload-range curve, which shows for the first time the effect of optional long-range tankage. With nominal reserves, the range with full payload is increased from 700 miles to 1,100 miles, and this latter version is, in fact, likely to be built for British United Airways, the first One-Eleven customer, to meet a requirement to fly London-Malta non-stop.

Take-off field length required at maximum weight ranges from 5,300 ft. in I.S.A. to 6,800 ft. at I.S.A. + 17° C.—in both cases at sea level. Assuming an initial rate of climb of 500 ft./min., the One-Eleven will be at 1,500 ft. two miles from the start of the take-off run, and the noise level on the ground at this point is calculated to be 96 PNdb.

A Space Symposium

NEXT month, a Seminar on Astronautics is to be held in Southampton from Jly. 12 to Jly. 19. Organized by Southampton University's Department of Aeronautics and Astronautics in conjunction with AGARD, this Seminar will be formally opened by Mr. E. T. Jones, deputy director of AGARD, on the morning of Wednesday, Jly. 12 after which an introductory lecture will be given by Mr. M. J. Lighthill, director of the R.A.E. In the technical sessions, 19 lectures will be given covering a large variety of allied subjects.

There will be an official dinner on the Friday, Jly. 14, at which the principal speaker will be David Price, M.P., the U.K. reporter to the Strasbourg Conference of the Consultative Assembly of Europe on European Space Co-operation. And during the Seminar, visits for members have been planned to the Royal Greenwich Observatory, the R.A.E.'s guided weapon department, the R.P.E. at Westcott, the Radio Research Station at Slough, and the Minitrack Station at Winkfield.

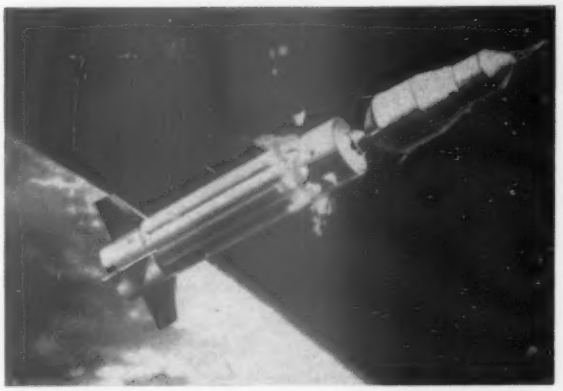
According to the programme: "The Seminar will cover a wide range of subjects which are of prime importance in the field of space technology and ample time will be devoted to discussion. The Seminar is intended for scientists and engineers whose work involves an interest in these subjects and also for students about to enter industry or research establishments after graduating in mathematics, science or engineering. There is no restriction on attendance as none of the proceedings are to be of a classified nature."

The total fee for the Seminar will be £21. Application should be made to Dr. B. L. Clarkson, Department of Aeronautics and Astronautics, The University, Southampton, Hants.

Tiros News

FROM the National Aeronautics and Space Administration has come some information concerning the achievements of the Tiros II meteorological satellite. Having been launched in November, 1960, the satellite was expected to function as a source of information for about three months. In May, it had already successfully completed six months of operation and was still transmitting useful data.

Tiros II has two television cameras and two experimental infra-red sensing systems by means of which global weather observations are made. According to NASA, up to May 22 no fewer than 31,485 photographs had been transmitted by the two television camera systems. Of these, it is said, 78% of the 9,488 narrow-angle photographs and 76% of the 21,997 wide-angle photographs have been classified as "fair to good" for meteorological analysis.



PROJECT APOLLO.—This artist's impression, released by NASA, gives an indication of how the three-man Apollo spacecraft may appear as it separates from the Saturn C-1 booster.

While both camera systems continue to operate and to perform at least as well as immediately after launch, the report goes on, one infra-red system containing five sensors failed on Apr. 28, after five months of successful operation; the other system has one of its sensors still operating and its other sensor failed only within the past two months. The one remaining sensor that is still operating has only limited use.

"A great mass of unique and useful data" has been obtained during the four to five months in which these infra-red experiments have been fully operational. These data are now being reduced, processed and studied. All the associated electronics, including the tape recorders, NASA adds, continue to operate.

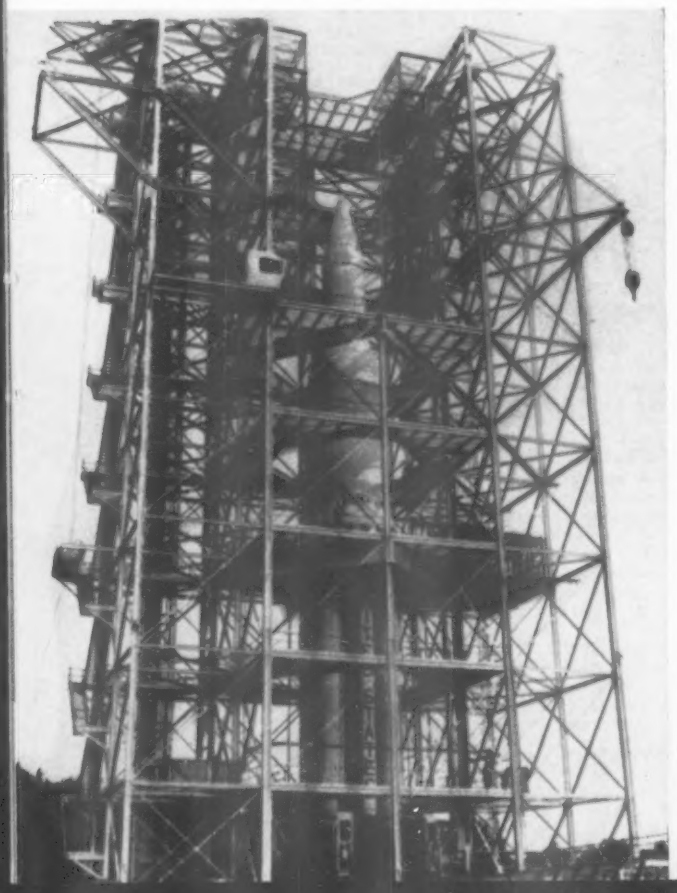
A third Tiros satellite is scheduled for launching during this summer. This, it is hoped, will be operating during the season when hurricanes are most likely to occur and circumstances will be such that TV pictures as well as infra-red data "on at least one of these destructive storms" can be obtained. The meteorological data will be given to the U.S. Weather Bureau and military services for their use in weather forecasting as well as for research purposes.

For Rocket Engine Testing

WHAT is claimed to be one of the largest rocket test sites in America and capable of testing engines equal, or superior, in size to any now existing, has been planned by the Rocket Research Corporation of Seattle. The Corporation has acquired the lease rights for a 25,000-acre site in Central Washington—on the Columbia river about 20 miles east of Ellensburg—and is planning the centre as part of a $500,000 five-point expansion programme. This new centre will be used for the testing of rocket engines and propellents designed "for future space and ballistic systems."

The Corporation's five-point programme includes:—Acquisition of new office and research facilities adjacent to the concern's present Seattle establishment and the addition of more science personnel to the staff; conclusion of arrangements for a 1,000-acre component testing facility near Seattle; increased expenditure in research programmes aimed at new developments in rocket technology and increased participation in bidding for space projects; and stepped-up research on industrial use of miniature motors and fuels developed for rockets and satellites. In addition, the Corporation is drawing up plans for future construction of a 1,000-sq.-ft. office and laboratory facility; it will include provision for manufacturing.

Formed in 1959, the Rocket Research Corporation comprises a five-man team of scientists formerly engaged on work for the Boeing Aerospace Division. It has submitted proposals to NASA and other agencies for the development and production of rocket engines for ICBMs and satellites using new propellents, and micro-rocket engines for satellite guidance. It is also engaged in research into the industrial use of miniature power units.



SPACE NEXT STOP.—The flight-weight prototype Saturn C-1 booster with dummy second and third stages has now been installed in a 204-ft. high test tower at Huntsville Ala.

Navigational Satellites

by J. F. Swale, B.A.*

FROM the vast expenditure of resources of both manpower and money on the rapidly expanding programmes of space exploration and exploitation have come scientific data in quantity to U.S.A. scientists, and prestige. But so far few practical results, other than the development of the technology, have been forthcoming, nor could they have been expected at this stage in the "race."

Practical results are promised, however: the technique of obtaining cloud cover photographs to improve long-term weather forecasting has been convincingly proven by the early Tiros satellites. Courier has proved the potentiality of delayed repeater satellites for point-to-point communications, particularly suited to military requirements. Active satellites at higher altitudes for trans-ocean, real-time communications are currently

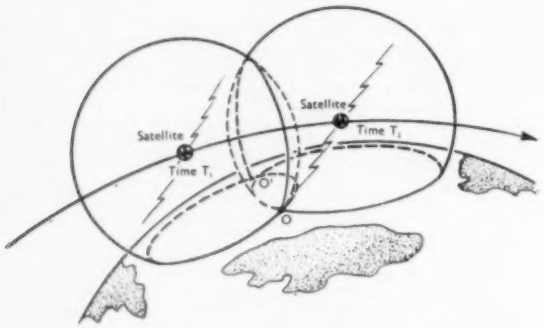


Fig. 1. Principle of time delay system. Time delay between signals transmitted from satellite at times T_1 and T_2 are proportional to the radii of the corresponding spheres round the satellite. Spheres intersect each other and the Earth's surface at O and O'.

receiving much attention, because of the promise of considerable commercial returns. Other examples could be multiplied, but undoubtedly the first operational satellite system of practical value will be for navigation.

It is the purpose of this article to point out some of the technical considerations relevant to navigational satellites.

Geometry

The position of an observer can in general be defined by three independent co-ordinates. For the purpose of navigation, however, the observer often knows, or alternatively does not require to know, his altitude. His position is then defined by only two independent co-ordinates. For example, with the knowledge of the local vertical as a reference axis, position can be determined by measuring the altitude of any two stars and referring to a nautical almanac. Also a single visual observation of Echo 1 against the star background, but without reference to an Earth-fixed axis, has yielded, under favourable circumstances, the position of the observer to better than one mile (Ref. 1).

However, the circumstances under which a satellite can be useful for navigation are precisely those under which the stars are not visible. And it is possible to determine position from a satellite without it being directly visible, by use of radio signals but without tracking antennae.

For example, if the range can be measured at two separate times, two spheres are defined whose circle of intersection cuts the Earth's surface (or any surface at known altitude) in two points, as in Fig. 1. It is assumed that the observer can distinguish between these two points if they are sufficiently far apart (i.e., unless the satellite passes almost directly overhead). This is the basis of the SEREB system described below, which measures range by the time delay between transmission and reception of a radio pulse.

The Transit navigational system employs the Doppler curve of received frequency against time to determine the second derivative of range with respect to time at the instant of closest approach (when received frequency equals transmitted frequency) and hence the minimum range, according to the formula given in Fig. 2. At this instant, the direction of relative motion of the satellite is at right angles to the line joining the satellite to the observer. This defines a plane. The range itself defines a sphere, and the circle of intersection of this with the plane cuts the Earth's surface at two points; between which it is generally possible to distinguish as before.

Accuracy of Orbit Prediction

A satellite navigational system requires the prediction of the position of the satellite at a future time to an accuracy better than that with which the position of the observer is required to be known. Accurate determination of orbital parameters is not a subject which can be fully discussed here; and, indeed, there is a vast quantity of literature on the subject. But it is important to appreciate some of the factors which at present limit this accuracy, as these affect the choice of orbit for the satellite.

Air drag not only limits the lifetime of a satellite, but non-periodic variations of density affect also the accuracy with which the orbit can be predicted. Forces arising from the perturbing effects of the Sun and Moon, and from solar radiation pressure, are small and their effects can be predicted with sufficient computational sophistication.

In fact the most troublesome feature in the very accurate determination of position in low orbits at present is the incomplete description of the gravitational field at low altitudes. In working to the degree of accuracy required here, variations

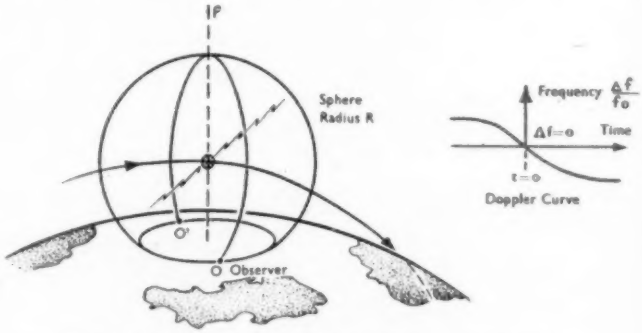


Fig. 2. Principle of transit position determination. Instant of closest approach (t = o). Plane P is normal to satellite velocity vector. Observers at O and O' receive similar Doppler curve near time of closest approach. Range $R = \frac{v^2}{c} \div$ slope of frequency curve at t = o (when v = velocity of satellite at t = o; and c = velocity of light).

in the density of the Earth's crust and the altitude of the surface are important. It is one aim of the early Transit satellites to find the coefficients of higher order terms in the Legendre expansion of the potential field of the Earth.

Choice of Orbit

Whatever functions of the satellite position or velocity are measured, it is clear that for accurate navigation the rate of change of the range of the satellite with respect to the position of the observer should be as large as possible. This requires that the satellite be in a low orbit. Air drag, and the gravitational field non-uniformities limit the minimum altitude to about 400 miles. As the satellite should be low wherever it is to be used, it follows that the orbit should be nearly circular at this minimum altitude. It is fortunate that even at quite low altitudes a small number of satellites would suffice to give adequate coverage, at least to surface craft.

Consider a system of four polar satellites, established so that

* Astronautics Division, Hawker Siddeley Aviation, Ltd. The opinions expressed are those of the author, and do not necessarily reflect the views of Hawker Siddeley Aviation.

the orbital planes cut the equator every 45° longitude. Then an observer on the equator will, on average, see a satellite once in every orbital revolution, for a simple calculation shows that the radio range of a satellite at 600 miles (with a 7.5° radio horizon) is about 23° subtended at the centre of the Earth.

Thus an observer on the equator may see a satellite and obtain a position fix from it up to 16 times per day, and observers at higher latitudes will be better served. Additional service can of course be given to equatorial regions if required by satellites in low inclination orbits. Position checks at 1½-hour intervals are certainly frequent enough for ships and submarines, but probably inadequate for aircraft.

Choice of Frequency

Bearing in mind that navigational satellites are most useful in conditions of poor visibility, frequencies should be chosen for the radio signals which are not unduly attenuated by rain or heavy cloud. This puts an upper limit on the frequency at about 1,000 Mc/s. On account of cosmic noise, and noise from sunspots and the atmosphere, the frequency for continued operation should be greater than 100 Mc/s.

These considerations are common to all communications through satellites, but there is another particularly significant to navigational satellites, namely refraction in the ionosphere. The ionospheric correction to the range is generally small, of the order of a mile, but is troublesome because it is not a constant, varying irregularly according to the state of the ionosphere, which depends not only on the time of day and the season, but also on the activity of the Sun. It is, then, simpler to reduce the correction rather than calculate it. The bending is inversely proportional to the frequency, hence a high operating frequency is indicated.

External factors, therefore, favour a frequency of several hundred Mc/s. Rate of data transmission and power requirements would also be taken into account in a fuller consideration, as would the problem of interference with existing communication frequencies.

Tranmission or Orbital Parameters

In the present state of the art, it is impossible to predict satellite positions to within a few hundred yards over the period of several months during which a ship or submarine might use the satellite. The orbital parameters cannot, therefore, be stored in the ship's computer before it leaves the port, but must be transmitted to it from the ground, either directly or via the satellite. For the near future the latter method is essential since corrections must be fed in every few days. The time required to feed in the information from the computing station (and to read it out again to the observer) is quite small.

The requirement of carrying recording equipment aboard the satellite does increase the weight by the order of 30 lb. Aircraft can use the parameters fed in before take-off, since these will be sufficiently accurate for prediction within the flight-time of aircraft. Orbital corrections can be fed into a satellite as often as it can be used for position fixing, so no additional requirements are imposed on the choice of orbit.

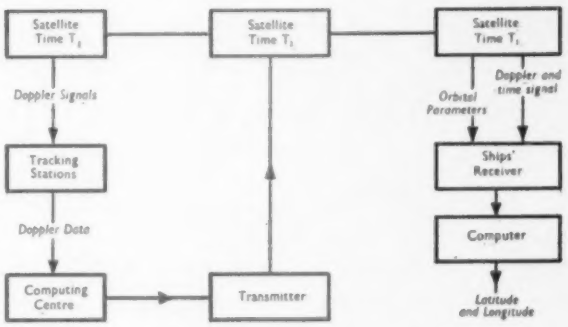
Transit Navigational Satellites

It was explained above how, in principle, only the slope of the Doppler curve could be used to determine position. A little further information can now be given about the Transit system, to show the state of development. The system will operate as indicated in Fig. 3.

Transit satellites already orbited have been experimental ones weighing about 260 lb., whereas the operational version, which it is hoped to launch in 1962, will weigh less than 100 lb. Considerable redundancy has been built into the system for the sake of reliability.

Instead of using only the central portion of the Doppler curve it is planned to use the whole of it for each pass. In this way a large number of points are obtained and subjected to numerical analysis. Positions are then determined by a continuous successive differential correction procedure. The early experimental versions use an inverse process, whereby the orbit of the satellite is obtained from the Doppler curves and the known location of the ground stations. Accuracies from this method are quite good, but rather less than the best tracking methods.

By transmitting on several frequencies (54, 162, 216, 324 Mc/s.) which give different amounts of bending in the ionosphere, it is hoped to learn more about the ionospheric corrections to be applied in the operational versions. Frequency stability over the short periods required is achieved by elaborate thermal protection of the frequency control mechanism, using reflectors, radiation blankets and nylon cord suspension to reduce heat transfer from the shell.



System of operation of Transit navigational satellite.

SEREB Navigational Satellite

A navigational system which measures range by the time delay between the transmission of a signal by a satellite and its reception by the observer has been proposed. The time delay must be measured to better than 1 microsecond, and for usefulness over a period of months an accuracy of one part in 10^{13} would be required—except that, if the error between successive passes is assumed constant, an error of one part in 10^9 can be tolerated. Such accuracy is within the capability of atomic clocks.

Power requirements for the SEREB satellite are estimated at 12.5 milliwatts, which can be obtained from 7.5 sq. ft. of solar cells. The weight of the satellite, in the version which relays orbital parameters, is about 55 lb., rather less than Transit, but of course several years would be required for development.

From all the foregoing it will be realized that although, of necessity, several considerations have been omitted and several problems glossed over, a navigational satellite system is sufficiently advanced that it will claim first place, in 1962, as a practical benefit of "Space."

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2. Project Transit. J. D. Nicolaides. *Aerospace Eng.*, February, 1961.
3. Industry and Space, published jointly by Hawker Siddeley Aviation, and Société pour l'Etude et la Réalisation d'Engins Balistiques, London and Paris, February, 1961.

Models of the successful twin satellites Transit IIA and NRL research package which separated in orbit after being launched by a Thor-Able Star booster on Jne. 22, 1960. The former represents an experimental navigation satellite of 36 in. diameter weighing 223 lb. It contains two ultra-stable oscillators; an infra-red scanner to measure the satellite's rotation; an electronic clock as a time standard, and a Canadian-built receiver for measuring galactic noise.

Postscript to Paris

Back-seat Flying at Le Bourget

By John Fricker

A FEW hectic days at the recent Paris Salon provided brief and fleeting opportunities for sandwiching a number of flights in visiting prototypes during a very tight flying programme. Unlike Farnborough, the Le Bourget show is a 10-day extravaganza of flight demonstrations for potential customers and other interested parties, who, where possible, are given the sales treatment at close hand by getting them airborne.

This, of course, is far more effective than any flying display which must be observed from the ground. Since the primary function of any such meeting is sales, the Paris Salon has much to commend it in providing a unique opportunity, as an international aviation market place, for flight comparisons to be experienced by visitors from all over the World. The only difficulty is that movements (in several languages) often reach saturation point during the demonstration days, particularly as they have to be fitted in between commercial schedules.

This tends to limit the scope and length of *vols de vente* and a great deal of time is often wasted through being held on the threshold for take-off clearance. Precise control was important, because, during most of the Salon, commercial traffic was taking off and landing on the long runway almost at right angles to that in use for display aircraft. Only once was any major emotion generated, when the ground-loving ramjet Griffon delta nearly intercepted a landing Constellation during a collision-course take-off.

Because of the traffic and language problems, plus the fact that many of the aircraft displayed were experimental prototypes, handling opportunities were fairly infrequent, but some back-seat impressions of a few of the Le Bourget exhibits are worth recording. They should be regarded in the nature of progress reports rather than more definitive material.

BEAGLE-AUSTER AIREDALE

The first prototype, G-ARKE, was flown to the show by Ranald Porteous, who also demonstrated it in the flying programme. However, as his was the first powered aircraft in the marathon display, being allowed five minutes from 10.00 hrs. on Saturday and Sunday, it is questionable whether many interested people were able to see

I was fortunate in being able to make two trips with Ranald: once in the right-hand seat with just two of us on board, and the second time in the back with a full load of four. We picked up Le Bourget tower loud and clear through the Motorola VHF, and during the long wait for take-off clearance, I jotted down some of the figures from the plaque of operating data inside the cabin. These included never-exceed speed, 155 knots, flap limit, 75 knots, climb, 70 knots, stall, flaps up, 48 knots, full flap, 41 knots.

Normal fuel capacity of the Airedale is 16 gal. in each wing root, which may be supplemented up to 54 gal. total with auxiliary fuel. I liked the compact, push-pull control wheels, the central floor location of the flap lever and its adjacent handy elevator trim wheel.

Acceleration on take-off was good during both flights—a bonus from the Airedale's standard variable-pitch propeller. Ranald pulled 'KE off at about 35 knots I.A.S. with a blip of stall warning horn after a remarkably short run. The Airedale's slotted flaps are a great improvement compared with previous Austers.

Noise level in the prototype is reasonably low, despite the exhaust thrust augmentation system, which has given an unexpectedly high boost to the Airedale cruising speed. This is around 115 knots at economical power, or well over 130 m.p.h. Experiments to improve soundproofing still further are continuing with both prototype Airedales, which are rapidly being followed by the first half-dozen production aircraft.

With full flap and power, Ranald Porteous showed that the Airedale would not only continue flying at 40 knots I.A.S., with intermittent blips from the stall warning horn, but still had plenty of lateral and directional control from aileron and rudder movement. Since this demonstration took place at about 700 ft., it said a great deal for its test pilot's confidence in the Airedale. At 35 knots I.A.S., stall warning was continuous, but the Airedale was still flying.

Control has apparently worked out well, although rudder self-centring is to be improved by automatic disconnection of the nosewheel steering linkage in flight. Directional control is naturally affected when a steerable nosewheel is fitted with a large spat of considerable side area. On the approach, which was at 50-55 knots with power, the Airedale felt very stable and comfortable and touchdown was gentle at a sedate 40 knots I.A.S.

A second circuit in the rear seat was equally pleasant. The rear door on the port side greatly facilitates entry, compared with previous Austers, and shoulder room proved adequate for two fairly well-built men. Take-off and climb did not seem unduly affected by the substantial load, and the Airedale was again taken down to a minimum flight speed of 40 knots.

As a concession to our weight, 5 knots was added to our approach speed, which was at 60 knots. I emerged from this first encounter with whetted appetite for a full-scale flight assessment.

PILATUS ASTAZOU-PORTER

One of the pleasures of the Paris show is that one meets so many old friends and acquaintances from the Continent and farther afield. The last time I had seen Herr Boehm and Herr Alioth, pilot and commercial manager of the Pilatus company, was on a grey, drizzly, miserable day at Thruxton in December, nearly two years ago, when I had struggled round a circuit or two with the Porter looking after its strange pilot with the sympathetic security of a nanny.

About the only difference on the more recent occasion was that the venue was Paris, which proves that foul weather is not solely a British prerogative. There was a considerable difference in the aeroplane, however, for in place of its normal supercharged 340-b.h.p. Lycoming, HB-FAD had one of the

Good acceleration and a lively take-off, even with a full load, is a characteristic of the new four-seat Beagle-Auster Airedale.

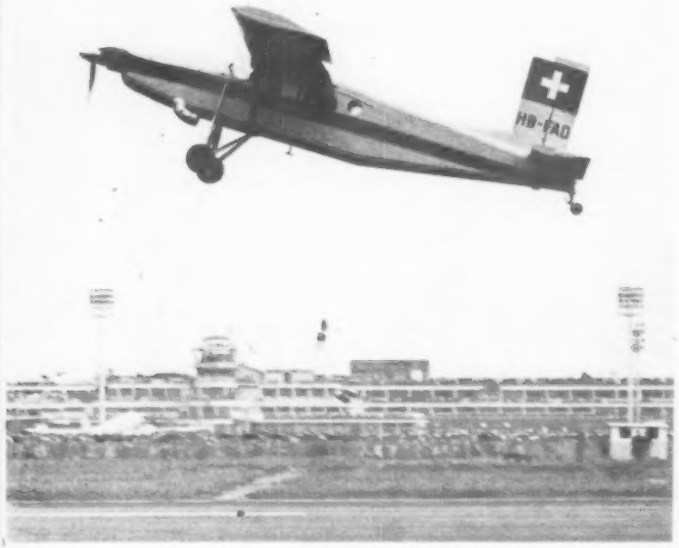
The S.F.E.R.M.A. Marquis is an attractive light executive twin and is powered by two Astazou turboprops.

Photographs copyright "The Aeroplane and Astronautics"

revolutionary 530-e.h.p. Turboméca Astazou turboprop units.

The long slim snout of the Astazou has elongated still further the functional angles of the Porter fuselage, but has added only 20 lb. to the empty weight. The extra power has enabled the gross weight to be increased from 3,970 to 4,320 lb. for little or no decrease in take-off performance. Tests in the 22 hr. or so completed since the initial flight of the adaptation on May 2 up to the Paris Show have shown that cruising speeds have gone up from 125 m.p.h. to 158 m.p.h. at 9,800 ft., with a corresponding decrease in endurance and range from 6 hr. and 746 miles to 3½ hr. and 500 miles.

The roomy cabin and single-control layout of HB-FAD brought back recollections of my Thruxton flight. Herr Boehm



Also powered by the remarkable Astazou turboprop, the latest version of the Swiss Pilatus Porter has outstanding slow flying capabilities.

was flying the Astazou-Porter at Paris and, on this trip, he had a French pilot in front with him. I was looking over his shoulder alongside M. Jacques Lecarme, well-known test pilot and engineer with S.F.E.R.M.A. who gave me a technical commentary throughout the flight.

Instrument layout was very much more simple than I remembered from the Astazou-Nord test-bed at Gatwick. To recap briefly on the operating principles of this Turboméca powerplant, it is a constant-speed engine running at near 100% r.p.m., chock to chock, with power varied instantly by electrically controlled airscrew (Ratier-Figeac) pitch. The pitch lever takes the place of a throttle control in piston engines, r.p.m. being governed for starting and shutting down by a variable fuel-flow datum.

I noticed that the Astazou-Porter started comfortably on internal battery power, with the revs. initially set to 90% for taxi-ing. A touch of the pitch lever, and we moved off gently towards the threshold, amid the usual considerable ground roar inseparable from a turbine powerplant spinning round at over 40,000 r.p.m. During the long hold before take-off, Herr Boehm wound down the r.p.m. to 60% with the vernier knob, reducing the noise and dropping fuel flow from 60 to 20 litres an hour.

After establishing 100% r.p.m. while lining up, he then pressed the automatic max. power button, and the pitch lever moved forward on its own to full thrust. Releasing the brakes, he leant on the stick to bring the tail up, and then heaved it back to unstick in a few yards after a highly stimulating acceleration. Touching the pitch lever immediately took control out of the auto range, and it was brought back to 70% power to give a "stooging" speed of 170 km./hr.; fuel flow was then 155 litre/hr.

Reducing power to 20% by pulling back the pitch lever to zero thrust gave a deceleration effect like running into a pat of butter. With full flap, and 35% power, the Porter could be flown level and hands off at 45 m.p.h., and tight turns were possible at 50 m.p.h., with only a blip of stall warning. Aileron response still seemed crisp and responsive.

The Astazou's automatic power characteristics, which simplify engine handling to a remarkable degree, were next demonstrated. Raising the nose was followed by an increase of power to 80%, with no further action from the pilot, and with the stick forward, the percentage power indicator fell to give only a small increase in airspeed. This response makes it a simple matter to follow a glide-path in Astazou-powered aeroplanes.

At 25% power, airscrew pitch is still 10° at 60 m.p.h. on the approach in the Astazou-Porter, but "throttling back" to zero pitch in the flare-out resulted in a very pronounced braking effect as the aircraft was banged on to the ground, to stop within a couple of fuselage lengths. This is yet another of the many advantages of the tractable Astazou turboprop, which at high altitudes and power settings has a better fuel consumption than the Lycoming which it replaces in the Porter.

At the moment, first cost of the Astazou is high, although its overhaul life is longer than that of many equivalent piston engines and fuel costs are about half. In the Porter, the Astazou gives 480 e.h.p. at continuous rating, including 25 kg. jet thrust.

About 25 Porters have so far been built, including five prototypes, and 20 pre-series, and the next 20 have been laid down. Material has been obtained for a further 40, and it is probable that about half of these may be Astazou-powered.

Leading particulars of the Astazou-Porter are: Length, 36 ft. 5 in.; height, 10 ft. 6 in.; empty weight, 2,245 lb.; disposable load, 2,075 lb.; take-off weight, 4,320 lb.; cruising speed, 80% power, 9,800 ft., 158 m.p.h.; climb, 1,280 ft./min.; service ceiling, 27,500 ft.; landing speed, 46.5 m.p.h.; take-off distance to 50 ft., 738 ft.; landing distance from 50 ft., 573 ft.; range, on 400 litres fuel, 500 miles; endurance, 3.5 hr.

S.F.E.R.M.A. MARQUIS

While in the Porter, Jacques Lecarme issued an invitation to me to see his company's Marquis executive twin, which is a Beech Baron converted to Astazou power. As this is the World's first practical light turboprop aircraft, I was most interested in flying in it, and immediately got in alongside test pilot Alligier.

The aircraft was the prototype Marquis, F-WJHC, which had been converted from the lower-powered (2 x 180-b.h.p.

Lycomings) Beech Travel Air. From the original total power of 360 b.h.p. to the 960 of the Astazou IIs in the Marquis was quite an increase, but necessitated only about 20 lb. of extra wing root and rear fuselage stiffening in the Travel Air. Other modifications included a 16-in. taller fin and rudder for maintaining a good VMC with the extra power, which for the same reason is restricted to a maximum of 480 e.h.p. instead of the Astazou's available 560.

The Marquis also has a tailplane of increased span and with dihedral—although the second aircraft, also displayed, and already delivered to M. Szydlowski of Turbomeca, has yet to receive the latter modification. This is a standard feature of the Baron, which, with two 250-b.h.p. engines, requires no wing strengthening on receiving Astazous.

Apart from the revised engine mountings for the turboprop powerplants, Baron-to-Marquis mods. are few. Those in the cockpit include doubled window surfaces to improve soundproofing, and a heated front screen for de-icing.

With the normal piston-engine soundproofing, the prototype Marquis was penetratingly noisy on the ground, but not too bad in the air. Before starting, I examined the neat cowling of the Astazous and then admired the complete segregation of hot and cold zones of the powerplants by longitudinal and transverse fireproof bulkheads, with fuel lines running beneath and outside the region of combustion.

For starting, the Ratier-Figeac airscrew blades are normally at slight negative pitch, although 13° was used in the prototype to give the 50-55° necessary range of movement at the high-speed end. Light-up is at 20% r.p.m.; the starter helps acceleration to 40%, disconnects at 50%, and the engine then opens itself to idle at 60%. The r.p.m. datum lever is then moved forward to the desired setting which, unless lower r.p.m. are required for quiet and prolonged taxi-ing, is usually at 99% (or 43,500) r.p.m. throughout the flight.

Locks on the pitch levers—the pilot's principal power controls—prevent less than 14° from being selected in flight in the Marquis, to avoid the dangerous discing consequences of going below flight fine pitch. The screw-type fuel regulators or "throttles" are used on the ground to synchronize engine speeds before take-off, after which no further synchronization, while the r.p.m. remain unchanged, is necessary.

Apart from one or two extra instruments, such as percentage power and r.p.m. gauges, the layout of the four/five seat Marquis did not differ appreciably, so far as I could remember, from the Travel Air. A sensitive A.S.I., with its large needle starting at 45 knots, had been installed. The fuel-flow meters were not operative in the prototype, which has the standard Marquis tankage of 750 litres, including leading-edge fuel tanks of 31 and 25 U.S. gal. on each side.

A touch of the button for automatic max. power, and the Marquis sped down the runway, with the pitch levers inching themselves forward to 35°. Rotation was at 72 knots, unstick at 75 knots, and a vigorous climb, with a full load, at 110 knots.

I gathered that VMC of 83-85 knots is only fractionally higher than that in the piston-engined original, despite the great increase in power. In the event of fuel-flow failure, pitch is automatically coarsened towards the feathered setting.

No single-engine flight was demonstrated, but the power margin is such that the rate of climb is claimed as 5 m./sec. (16 ft./sec.), and the asymmetric ceiling, 6,000 m. (19,700 ft.). Normal initial climb is a formidable 16 m./sec. (52 ft./sec.), falling to a very respectable 9 m./sec. (30 ft./sec.) at 5,000 m. (16,400 ft.). The 11,000 m. (36,000 ft.) ceiling clearly calls for serious consideration of pressurization for the generation of light turboprop executive and transport types made possible by the Astazou.

Even at 40% output, the Marquis clipped along, with a pleasant surge of vibrationless power, at a striking 165-170 knots, at only 1,000 ft. Its level maximum performance at any altitude is no less than 450 km./hr. (320 knots), a typical cruise at 80% being 190 knots I.A.S. at 10,000 ft. The Marquis has no dual control, but leaning across to try the ailerons these did not appear to be appreciably heavier despite the great increase in cruising performance.

The Marquis flew the 300 miles or so from Bordeaux to Le Bourget in 1 hr. 14 min., using about 300 litres of fuel. This compares well with piston-engine performance, and Astazou handling, if anything, is simpler. With a guaranteed initial overhaul life of 700 hr., these small turboprops can undoubtedly be considered to have arrived, even without the automatic power facility which was further demonstrated in the Marquis.

A reduction to 30° pitch, and power fell to 15% and the speed to 150 knots for the circuit. The approach was made at 23° pitch and 125 knots, with 100 knots on finals and a touch-down at 80 knots before selection of zero pitch and a smooth deceleration.

Six Marquis have already been sold, and further Baron conversions are in hand. There is no doubt that the practicability of an engine such as the Astazou is going to have a profound effect on executive and light transport aircraft design in the very near future.

MORANE-SAULNIER PARIS II

Last over-the-shoulder flight at Le Bourget was in the revamped Paris four-seat light jet, which differs mainly in having two 1,060-lb. s.t. Marboré VI engines providing 20% more static thrust and an 8% decrease in a.m.p.g. Additional fuel capacity of 113 U.S. gal. results from installation of integral leading-edge tanks, plus fuselage and tip-tanks of 247 and 127 U.S. gal. Anti-icing has been added to air and engine intakes.

A stronger undercarriage has been installed to increase the take-off weight from 7,700 to 8,600 lb. M. Guillaume, who was flying the Paris II demonstrator, taxied the aircraft out at 15,000 r.p.m. to the accompaniment of a penetrating whistle from the Marborés until the canopy pressurization seals were inflated to cut it out. During the usual prolonged hold, we idled at 6,500 r.p.m. on one engine and 10,000 on the other, presumably to maintain generator output.

Take-off acceleration was brisk at 21,500 r.p.m., and all-round view was superb. The rear-seat passengers are appreciably higher than the front occupants, and the big clear-view canopy offers no restriction to visibility. Unstick was at 90 knots, with a fuel-flow of 650 litres/hr., and we climbed gently away, for a quick circuit at 120-130 knots. No perceptible vibration was apparent at a low-altitude run at 21,500 r.p.m., giving an indicated 300 knots.

With 19,000 r.p.m. on the Marborés, Paris progress was quiet and smooth at an airspeed of 265 knots and fuel-flow of 400 litres/hr. After a high-*g* turn, air-brakes were extended at 300 knots to give quite a violent deceleration down to circuit speed of 140 knots. Approach was at 110 knots, and touch-down at a gentle 85 knots. I had enjoyed flying Cranfield's Paris I some time ago, and the Mk. II (five sold to date) seemed even more pleasant.

Leading particulars include: span, 33 ft. 3 in.; length, 33 ft. 6 in.; height, 8 ft. 6 in.; wing area, 194 sq. ft.; sea level climb, 2,560 ft./min.; single-engine climb, 300 ft./min.; max. level speed, 25,000 ft., 442 m.p.h.; cruising range, with reserves, at 20,750 r.p.m., and 25,000 ft., 940 n.m. in 2.43 hr.; take-off to 50 ft., 3,700 ft.

Latest version of the Morane Saulnier Paris, the Mk. II, has two 1060-lb.s.t. Marboré turbojets.

Photograph copyright "The Aeroplane and Astronautics"

Gliding Notes

by Dr. A. E. Slater

ANOTHER pilot has flown to Stanford Hall, near Rugby, in pursuit of the Pilcher Memorial Trophy offered by Lord Braye, whose father was host to Percy Pilcher, the gliding pioneer, when he experimented there over 60 years ago. On Apr. 15, as already related in these Notes, Geoffrey Stephenson flew there from Dunstable, 45 miles away. But that was a Saturday, and landings have to be made on a Sunday or Bank Holiday to qualify for the trophy, which is to be given annually for the longest glider flight ending at Stanford Hall before Sept. 30.

On Sunday, May 28, four people set out for Stanford Hall from the Midland Club at Long Mynd, 75 miles away. The weather chart showed a U.K. devoid of isobars, with nothing but a light westerly wind which became light easterly in the afternoon. Two pilots came down almost at once, one had to land at Warwick, and only Bernard Wright, a Rugby man, succeeded, though he also was nearly brought down at Warwick.

The landing area is marked by coloured strips and two white-coated attendants are ready to help. One wonders if they are grandsons of some of the estate staff who used to pull Percy Pilcher into the air.

* * *

AN Irish distance record was set up on May 21 by Michael Slazenger, who took off from the Dublin Gliding Club at Baldonnel at 12.50 and averaged 28 m.p.h. on a 90-mile flight to Tipperary. This, of course, is a long way, as every pupil at the Salzburg gliding school told me (to music) in 1935.

The weather chart shows that a cold front from the N.E. went through just before 06.00 hrs. The sky, Michael says, was full of beautiful cloud streets. He flew the Chilton-built Olympia which Dudley Hiscox owned from 1946 until this year; Ralph Slazenger, a founder and trustee of the Cambridge Club, bought it for his son as a 21st birthday present.

Another flight in it by Michael Slazenger was a climb in a wave to 9,700 ft. on May 13; it was late in the evening, and he landed at 20.40 hrs. There was a S.W. surface wind. The Wicklow Hills are S. and S.E. of Baldonnel.

On May 28 Michael Jacob soared the same Olympia in thermals for five hours; this is the longest Irish thermal flight.

* * *

POLAND has sent, or is sending, pilots to eight different national contests in Europe this year. Jerzy Adamek has already flown in England, Edward Makula is booked for Switzerland, Adam Witek for France, Mrs. Pelagia Majewska for Italy, and others for Austria, Hungary, Czechoslovakia and Yugoslavia.

At the Polish National Championships, in full swing at the time of writing, visiting pilots have come from all these countries (two from Czechoslovakia), and also from Bulgaria, E. Germany (two), Rumania, and U.S.S.R. (two). Altogether there are 55 competitors, each flying a Mucha Standard, of an improved type compared with the original prototype.

On the first contest day only five or six got back from an out-and-return race of 200 km. On the second day eight got round a 300-km. triangle. But on the third day most of them succeeded in getting back from another 200-km. out-and-return race. Up to this time Marchand of France was doing best out of the foreign visitors. Lorne Welch is representing Great Britain and Ann Welch is his team manager.

Many of the Polish pilots, I hear, are of the "up and coming" type and are very good. Nearly all retrieving is being done by air with Po-2 tugs.

* * *

CAMBRIDGE University Gliding Club has benefited from the use of a Skylark 3 and an Eagle, each of which has been hired out to the club by its owner on condition that he can turn up and fly it whenever he wants to. But the writing-off of the Skylark in an accident at Fen Ditton—of which the cause is still a mystery—has raised the problem, not merely of how to replace it, but of whether to replace it at all. At the Annual General Meeting on Jne. 6 it was particularly interesting to hear this matter discussed, because it involved such questions as: what is the purpose of a gliding club and why do people want to soar?

At one extreme was the point of view of the treasurer, who was against trying to raise money for another Skylark 3 because, he alleged, "nine-tenths of the members are not interested in flying to Exeter"; they only come along to do an hour or two's soaring. He himself was content just to fly, without a thought of earning badges.

At the other "extreme" was Ken Machin, the chief instructor, who pointed out that anyone who merely wants time in the air can cross to the other side of Marshall's aerodrome, where the aeroplanes live, and get all the flying he wants for £3 10s. an hour. The club, Ken Machin said, must decide what it wants to be; he himself wanted it to be one of the leading clubs in the country as it has always been, and not merely a training club exporting pilots to progress to high-performance soaring elsewhere.

Between these two views there was the argument that a Skylark 3 would relieve the pressure on inferior machines; but, on the other hand, that few undergraduates could reach Skylark 3 stage before leaving—though the club also includes many resident graduates and townspeople. Anyway, Ken Machin deplored the idea of fitting the club fleet to the present skill of its pilots, for the result would be stultification.

To encourage the unambitious, Anthony Edwards related that it took him a dozen cross-countries before he really began to enjoy them. Who, he asked, decides what the club is for? Machin immediately answered: "tradition," but somebody else piped up with "Rule One."

"Rule One" may be the technically correct answer, but "tradition" surely counts for something. It should not be forgotten that organized British gliding was started in 1930 only because of the unprecedented distance and altitude flights put up by Robert Kronfeld and others in Germany during 1929. Yet there was a school of thought in the British Gliding Association in the early 'thirties which regarded the purpose of the B.G.A. as to get a lot of "Youth" running about on hills with primary gliders, and soaring as no more than a useful publicity stunt for acquiring taxpayers' money for the other sort of gliding.

The Cambridge Club is unique in allowing—indeed, insisting on—everybody flying on credit; members get their bills at the end of term, along with those of their tradesmen and college. This results in a pile of bad debts with which quite a lot of equipment could be bought; but, as one member explained, the system "encourages people to fly beyond their means," and another was sure that, if collecting boxes were installed on the field, a lot of people with almost empty pockets, who would otherwise have flown, would refrain from doing so.

* * *

This year's cross-country season at the Cambridge Club started as early as Mar. 19, in a wind blowing directly from the Arctic, with "a somewhat unintentional excursion" to Linton by Stewart Johnstone, owner of the aforesaid Skylark 3, and 33 miles to Chipping Ongar by Stewart Waller in a syndicate Swallow—the one in which he soared from Nympsfield to Lasham on the day League 2 in the National Championships were racing from Lasham to Nympsfield.

Not much later, on Mar. 25, John Pringle, the club president, flew the Skylark 2 to Great Yarmouth, 73 miles, and John Brenner nearly reached it in the Olympia.

To help club members *in statu pupillari* with the cost of gliding, the United Steel Companies, Ltd., have established a fund which at present amounts to £25; applicants can claim for three-quarters of their retrieving costs on certain flights.

* * *

INSTEAD of returning his Skylark 3 from the National Championships by road, C. W. "Chuck" Bentson flew the 52 miles back to Dunstable on May 28, leaving Lasham at 16.50 and arriving at 18.30. On Jne. 3 he set off on a 300-km. triangle from Dunstable, but ran into overcast soon after the first turning point at Downham Market and returned as far as Cambridge, 105 miles in all.

* * *

WHEN will the Standard Austria, which won the OSTIV prize for the best Standard Class machine at last year's World Championships, go into production? It was originally sponsored by the Austrian Aero Club, but now, the Swiss *Aero Revue* states, the club is under different management and has decided that the production of sailplanes is not its business.

Consequently any firm which undertakes to build the machine will have to pay a licence fee to the club as well as ensure its own profit. Pointing out that all this will raise the price considerably, *Aero Revue* deplores that "Idealismus" should thus be replaced by commercial considerations.

* * *

AT Camphill, Great Hucklow, the Derbyshire and Lancashire will be running a competition from Saturday, Jly. 29 to Monday, Aug. 7 inclusive. This must be the first competition meeting to be held there since the World Championships in 1954. Entry forms can be had on applying to the Competition Secretary at the club, and the entry fee is £5 per team.

Another competition, confined to the Bank Holiday week-end, will be run by the Lakes Gliding Club at Tebay.

Industry Record

Moscow Success

The British Trade Fair which ended in Moscow on Jne. 4 proved to be a great success for many of the companies that exhibited there. Among them was Goodman's Industries, Ltd., of Wembley, who tell us that not only did they sell their entire display of vibration generators, power amplifiers and instrumentation valued at £6,500 but also obtained orders worth £40,700 for more products in this range. Also, so many inquiries were dealt with during the period of the Fair that the company anticipates additional orders during the coming months.

New Company

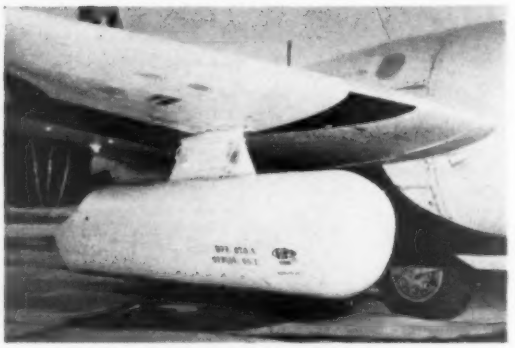
From a Scottish correspondent comes news that Grafton Industrial Securities, Ltd., and Scottish Aviation, Ltd., have formed a joint company to supplement the activities of Air Engine Services (U.S.-U.K.), Ltd., itself a subsidiary of Grafton and the Scottish Aviation engine reconditioning division. This new company, Scottish Air Engine Services, Ltd., will operate from Scottish Aviation's Prestwick premises. Air Engine Services will continue to function independently from Blindley Heath, Surrey.

Alcan News

The area served by the Luton sales office of Alcan Industries, Ltd., will, on Jly. 1, be extended to take in Oxfordshire and the southern portions of Buckinghamshire and Essex hitherto covered by the London office. Situated at 57 Bute Street under the management of Mr. J. B. Rayner, the Luton sales office now assumes area status.

A.R.B.-Approved

Ekco Electronics, Ltd., announce that its type E210 transistor inverter has received unlimited A.R.B. approval, and becomes the first of the Ekco range to do so. It is a fully transistorized single-phase instrument for general-purpose applications and is stabilized against variations of input voltage and output load. It has an output rating of 15 VA continuous running or 35 VA for short periods. One of the first applications for this instrument is for operating the Sperry gyroscope type HL9.



The container for the R.F.D. air-launched banner target pylon-mounted on a Meteor.

Fighter Pilot's Objective

An air-launched banner target is the latest development from the R.F.D. Co., Ltd., a concern whose interests range from rescue and survival equipment of all kinds to training balloons for paratroopers. This new target has been developed in conjunction with the R.A.E., Farnborough, where it was first demonstrated on Jne. 9.

Made of nylon leno and incorporating a radar responsive spreader bar, the target is packed, together with 800 ft. of nylon cord tow cable, in a light-alloy container and attached to an aircraft wing pylon. On release the bundled target drags the tow cable out to its full extent, breaks the retaining cords and unfurls. Fully deployed it measures 6 ft. by 30 ft. Attacking aircraft pick up radar responses at a range of 6,000 yd.

A number of advantages are claimed for this new air launching method over existing equipment. The principal of these is that wing pylon storage enables more than one target to be carried by the tug and also a standard squadron aircraft may be used for this duty without modification. Furthermore, there are no ropes or ties to cause runway hazards and it is unnecessary to stream the banner until the target area is reached. Weight of the target when stowed is 227 lb., the banner weighing 47 lb. and the rope 36 lb.

At the Farnborough demonstration a Meteor was used as the tug. The banner target has, however, been designed also for use with both the Javelin and Hunter; with the latter type the tow is from a central hook on the fuselage.

The R.F.D. company is now working on a similar target of advanced design for use at very high speeds and another for snatch pick-up from the ground.

Gauge and Tool Handbook

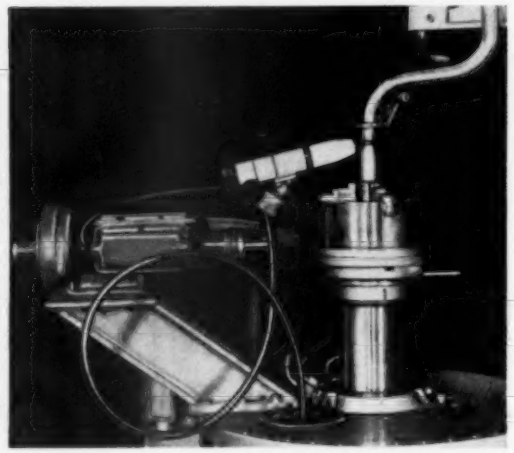
Eighth edition of the Gauge and Tool Makers' Association handbook and buyers' guide index has recently been published and is available free of charge to all buyers and potential buyers of tools and gauges. It can be obtained on application to the Association at Standbrook House, 2-5 Old Bond Street, London, W.1. Information contained—in addition to a summary of the aims, objects and activities of the Association—includes addresses and telephone and telegraphic information on the 386 member companies, a comprehensive buyers' guide index and names and addresses of British Power Press Manufacturers' Association members.

Out of Town

Valay Industries, Ltd., makers of the Jove range of cleaning and polishing products for aircraft exterior and interior surfaces have now moved out of the London area to larger premises in Surrey. Their address is now Davis Road, Chessington; telephone, Lower Hook 2166.

Data Processing Data

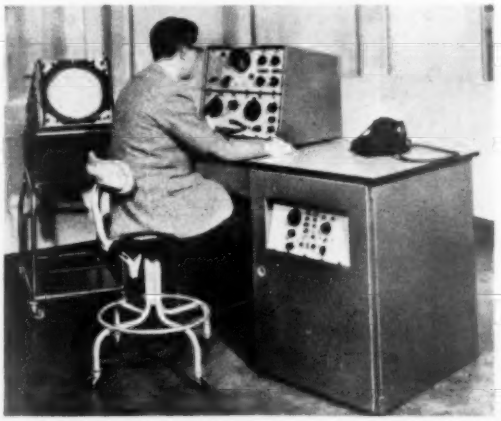
A guide to the future requirements of paper tape readers and punches for use with data processing equipment has been produced by the data processing section of the Electronic Engineering Association. This has been forwarded to the British Standards Institution and in due course is to be considered as the basis for a British standard. Copies are available on request to the Association's technical secretary at 11 Green Street, Mayfair, London, W.1.



As briefly described on page 304 of our Mar. 17 issue, by means of the precision orbital welding method devised by Palmer Aero Products, Ltd., a preformed tube can be automatically joined to an end-fitting. Alongside is a close-up of the welding head which does this.

Lox on Trial

According to the British Oxygen Co., Ltd., one of the main reasons for the recent 8 hr. 2 min. endurance flight by a D.H. Sea Vixen (noted in our issue for Jne. 8), was to test the aircraft's 3¼-litre liquid oxygen breathing system. At the end of the flight it was found that only part of the liquid oxygen had been consumed by the pilot Mr. C. Capper and his observer Mr. J. Rye. Similar systems have been supplied by B.O.C. for the Lightning and Gnat Trainer.



This six-target fully transistorized radar simulator now being produced by the Solartron Electronic Group, Ltd., can provide variation of target blip size with range, M.T.I., and weather and video mapping.

Correspondence

Freedom—with Control

THE subject of unrestricted use of airfields and airspace by "general aviation" has aroused much interest recently. Criticisms on both sides are amply justified.

My personal view is that all airfields and airspace *should* be available to all aviators at all times; I do not believe that with today's air traffic control techniques any British airspace has yet reached saturation point. (American traffic figures would seem to confirm this.)

However, I do shudder at the thought of unrestricted flying for all in a busy traffic area as conditions obtain at present. The small minority of ill-equipped, badly flown private aircraft could present a tremendous potential danger to public transport aircraft on scheduled services; the well-flown, sensibly equipped private aircraft can at all times be handled with safety, although not always with expedition.

The solution I propose is two-fold. First, to permit all suitably equipped aircraft to use all airfields and airspace at all times (I do not, for example, suggest non-radio aircraft should be permitted to fly on airways). Secondly, all airport and airspace authorities to have the right summarily to revoke the licence of any pilot guilty of dangerous flying, grossly bad airmanship or infringement of the Rules of the Air; such revocation to stand until reviewed in court.

In this way the few bad pilots would soon find themselves grounded, whilst the great majority of competent private fliers would be able to use the air with comparative freedom.

The power of revoking licences could safely be vested in Airport Commandants and Air Traffic Control Centre Supervisors, who are directly responsible for in-flight safety. Persons capable of holding these posts are unlikely to be of a type to abuse such powers.

This may be rough justice but it is essential if both safety and freedom of the air are to be maintained. By the time the present legal machinery takes action the offending pilot may have already flown dangerously again, possibly with tragic consequences.

In the system I have proposed the court action would be for a return of licence if the offence were not proved. If the offence were proved the pilot could be treated like a motorist in similar circumstances by having his licence withheld for a period of time, or by being made to pass his licence again before resuming flying solo. As an alternative to revoking the licence the airport and airspace authorities could be empowered, in the case of a proven offence, to endorse the licence as invalid for their area of control for a stated period.

In this way bad airmanship would be penalized, and its incidence greatly decreased. Surely it is time that responsible, or irresponsible, airmanship be made the criterion for use of the air and not size, ownership or the purpose of a flight.

Having stated my views it is only fair to state the stake I have in the question, and which "side" I belong to in the controversy. I am a practising Air Traffic Controller; however, the views expressed are my own. (They are in no sense official views, and doubtless are shared by few of my colleagues). I am not a private pilot.

Jersey, C.I. T. F. PEPPITT.

Noise Wanted

COULD you give me any details of airfield clearance of birds? I remember reading that several airfields were experimenting with different ideas for clearing airfields and local areas of birds so that they will not menace aircraft. I am particularly interested in any development using the method of *noise*. If you have any details or know of someone who can help me on this subject I should be very grateful for any information you could offer.

Khormaksar. "BLACKADDER PHILLIPS."

[Replies will be passed on to our correspondent.—ED.]

Spacecraft Speculations

I CANNOT agree with all the speculations of your correspondent G. B. Bathurst on the Vostok (THE AEROPLANE AND ASTRONAUTICS, Jne. 1). I expressed my own opinions on Vostok recently in an article in the B.I.S. newsletter "Satellite News Bulletin," and I would like to reiterate one or two points here if I may.

Firstly no photographs of the exteriors of any of the spaceships have been released. The photograph to which Mr. Bathurst refers shows the ejectable dog-cabin, which in the third orbital flight of Vostok was replaced by the pilot's ejector seat; both of these were mounted on rails running across (not along) the spaceship so that they could, if necessary, eject through one of the two escape-hatches described in the *Izvestia* statement.

A glance at the photograph of the dog cabin reveals at once that it is too small to accommodate a man even lying lengthways in it, and the photograph of the interior of the pilot's cabin reveals that if Major Gagarin did travel in the dog-cabin, then he must have been lying across it! (The camera pointing out of the centre of the interior photograph showed the pilot full-face).

Also if Major Gagarin lay on an ejector-couch mounted along the same rails the *g*-forces at launch would act from chest-to-back. I agree with Mr. Bathurst that Vostok probably does not re-enter backwards, so the pilot's seat would swivel to permit re-entry forces to act from chest-to-back. A little

Groundabout

Thus it goeth. We all like the human touch in impersonal technical reports. Such as that in a report on climatic trials with the CC-106 (military CL-44 for the R.C.A.F.). The R.C.A.F. Engineer Officer attached this photograph to illustrate Item 24 which went: "A failed and urgently required sealing O-ring, not listed in any Engineering Order and therefore unlikely to be obtainable quickly, was made up locally from a larger one by cutting and splicing, see Fig. 12." Canadair project engineers added the caption which, in case you can't quite read it, says: "Fig. 12—Ecclesiastes 1/15." Still being helpful, let me recall to you the Biblical reference: "That which is crooked cannot be made straight and that which is wanting cannot be numbered."

Fig. 12 - Ecclesiastes 1, 15

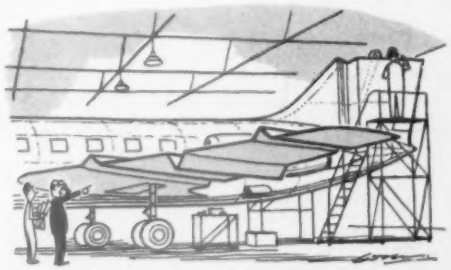
*

Counted Down—and Out. S.A.S. have sent me a Japanese soroban, better known as an abacus, the original digital computer, literally. It's so simple that a child of five can understand it. Unfortunately, I don't have such a child handy to deal with my mathematical or monetary problems, even if I had any. In order to test the S.A.S. claim that the soroban, like their North Pole DC-8 service to Tokyo, is a time-saver, perhaps they'll try me out on both.

*

Bouquet Becomes Brickbat. Touchy business, this humour-writing. De Havilland's, in their June *Gazette*, printed on their famous funny page "I told this chap that in Ramadan you can't eat, drink or smoke, and he said 'sounds like a Qantas flight to me!'" *Meaning*, as I read it, "sounds as if you'd better fly Qantas and let their lush catering banish all thoughts of the rigours of Ramadan." Anyway, that was the worthy intention of the D.H. writer who had recently experienced the Qantas treatment. Alas, there were those who read it the other way and red faces are now rife in the Hatfield Dept. of Humour.

*



"Oh no! Those are folds in the working drawings!"

by Gren

thought shows several methods of overcoming the consequent difficulty of placing the controls.

We know that the ejector-seat could eject through one of two hatches, possibly one for a launch emergency and one for a landing emergency. Though it seems much more likely that the whole space-ship would separate during a launch malfunction and would then land normally. In that case the pilot, if he ejected, would always have his back to the wind-blast, and his seat would not need very much in the way of protection-shields, which would facilitate the swivelling of the seat in a fixed cabin.

I cannot agree at all with Mr. Bathurst on the question of the launching technique. We have no evidence to support the air-launch theory, and it is difficult to see how even the big Bison bomber (which we are pretty sure is the largest the Russians have) could lift the 4½-ton Vostok and the rocket needed to boost it to orbital velocity.

On the other hand, we do have a lot of evidence to support the supposition of a normal launch technique. It seems that Vostok was based on experience gained with the 10,000 mile-range winged T4-A missile which the Russians developed from the German Sanger-Bredt proposals, and this is launched vertically. We have the repeated test-firings down the Pacific missile range of apparently conventional rockets of the type which launched Vostok, and we also have the extensively retouched picture of the "straight-up" launch of Vostok, though I admit that this is not much to go by.

We now have the Tass statement to the International Aviation Federation (made since Mr. Bathurst wrote) that Vostok was launched by a rocket powered by six first-stage engines, which points to something half-way to Saturn.

I do agree that the lift looks like something out of Science-Fiction, but after all, it is Russian, so why should it look like the small lifts we are used to? Perhaps on that longed-for day when Saturn becomes operational, the Americans will be using lifts like that one.

Dolgellau, Merioneth. LIONEL S. BUTCHER.

Group Captain J. R. H. Merifield

THE death of John Merifield in the Whirlwind crash will be a loss to the Royal Air Force comparable only with other great tragedies of the post-war period.

I first met John Merifield when he was a flight lieutenant flying the P.R.U. Mosquito in which he did such sterling work—including the photography which led to the Peenemünde raid and which probably shortened the War; certainly it saved many thousands of lives in this country. Then there was his record-breaking flight across the Atlantic from Newfoundland to Cornwall in the Mosquito; his "ops" in Korea; and, more recently, his command of R.A.F. Khormaksar, during which time Aden saw greater changes—for the good of personnel (and the Service)—than in any previous years.

From the moment he left Oxford University, at the age of 19, to join the R.A.F. in 1939, John Merifield—pilot officer or group captain—was heart and soul for his Service. When, after almost 20 years I renewed my acquaintance with him, he was a wing commander in A.M.P. Dept., responsible for the postings of wing commanders in the General Duties (Flying) Branch. During my happy association with him in Adastral House I learned the real meaning of "Compassionate Posting"—a term often abused and misused. If John Merifield believed a man had good reason to travel accompanied by his family, or to delay his movement for personal reasons, he would move heaven and earth (in the shape of an A.O.C.-in-C. or Air Ministry Movements) to help the man.

We will all remember Group Captain Merifield when we speak of an "officer and gentleman" and send our deep and very real sympathy to his family, and to the relatives of Flg. Off. B. M. L. Armitage.

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THE cabin air conditioning and pressurization of modern high-performance aircraft has assumed major importance when engineering an aircraft and when considering its ultimate performance. Some time ago it became obvious that, to achieve engineering and operational efficiency, all the various aspects of cabin conditioning and pressurization should be integrated, and thus the complete system concept was born, with Normalair, Ltd., pioneering such systems in Europe.

Much of this complete system know-how and experience has been put to good use by Normalair on the Bristol 188, and it is only right that due acknowledgement should be made of this when publicising lists of suppliers. In your issue of May 11, it was stated that the 188 cold air unit is from the Godfrey stable—whereas it is a Normalair product. In addition to supplying the "air conditioning equipment" mentioned against their name, and the cold air unit, and the oxygen equipment, Normalair provided all the cabin pressurization equipment—although the list you published lays the latter at Teddington's door. I trust this letter now puts the record straight.

Yeovil. A. W. GREGG,
Group P.R. Manager, Westland.

Aviation Calendar

Jne. 24

Arbroath.—R.N. Air Station At Home.

Bristol.—National Flying Display organized by Bristol Corporation, at Lulsgate Airport. (Not Jne. 17.)

La Baule.—Invitation Air Rally for members and associate members of the Royal Aero Club; until Jne. 25.

Lessay.—Coutances and Channel Central Aero Club International Rally; until Jne. 25.

Vichy.—Vichy Aero Club Rally; until Jne. 25.

Jne. 25

Leicester East.—At Home organized by Leicestershire Aero Club.

Wolverhampton.—Wolverhampton Aero Club Competitors Day.

Jne. 26

London.—European Symposium on "Space Technology," at the Federation of British Industries, 21 Tothill Street, S.W.1, from 10.30 hrs. to 17.00 hrs.; until Jne. 28.

Jne. 30

Sicily.—Palermo Aero Club Thirteenth Tour of Sicily; until Jly. 3.

Company Notices

NEW COMPANIES

Aviation Developments (1961), Ltd. (694,155).—Private co. Reg. Jne. 1. Cap. £100 in £1 shs. To carry on the business of manufacturers of and dealers in tools and equipment of all kinds for use in the aircraft industry. Directors: Edward S. Pearson, 4 Oakfield Road, Harpenden. Geoffrey V. Roe, Great Brook, Warsash, Hants. Sec.: D. E. Davies. Reg. off.: 2 Woodfield Road, Welwyn Garden City, Herts.

Driving Tutors, Ltd. (693,993).—Private co. Reg. May 30. Cap. £100 in £1 shs. To carry on schools, institutions and colleges for teaching and training persons as motor drivers, aviators and engineers. Directors: Frank J. W. Vogel, 5 Henley Lodge, South Norwood, S.E.25. Bernard E. H. Fox, Flat 1, 105 Dagnall Park, South Norwood, S.E.25. Reg. off.: 1a The Parade, Old Lodge Lane, Purley, Surrey.

Peter J. Garrini and Associates, Ltd. (694,139).—Private co. Reg. Jne. 1. Cap. £100 in £1 shs. To carry on the business of aeronautical experts and consultants. Directors: Peter J. Garrini and Mrs. Jean Garrini, both of 41 Methuen Road, Edgware. Kenneth B. Graham-Taylor, 27 Cranborne Gardens, N.W.11. Sec.: Mervyn J. Fine. Sols.: E. M. Solomons, Edgware. Reg. off.: 120 High Street, Edgware, Middx.

CHANGES OF NAME

De Havilland Aircraft Company, Ltd. (372,282), Hatfield Aerodrome, Hatfield, Herts.—Name changed to De Havilland Forge, Ltd., on Sept. 30, 1960.

De Havilland Holdings, Ltd. (170,435), Great Nast Hyde, Hatfield, Herts.—Name changed to De Havilland Aircraft Company, Ltd., on Sept. 30, 1960.

W. S. Shackleton, Ltd. (296,581), 175 Piccadilly, W.1.—Name changed to W. S. Shackleton (Aviation), Ltd., on Oct. 7, 1960.

Vokes, Ltd. (314,592), Henly Park, Normandy, nr. Guildford, Surrey.—Name changed to Vokes Group, Ltd., on Sept. 30, 1960.

New Patents

APPLICATIONS ACCEPTED

873,473.—**Blackburn Aircraft, Ltd.**—"Container for supplies for dropping from aircraft."—Jne. 16, 1958. (May 2, 1957.)

873,679.—**English Electric Co., Ltd.**—"Aircraft."—Oct. 6, 1959. (Oct. 8, 1958.)

873,634.—**Bell Aerospace Corporation.**—"Combined aircraft flight altitude control means including a controllable airfoil."—Mar. 3, 1958.

873,635.—**Bell Aerospace Corporation.**—"Jet reaction nozzle device for airplane flight control."—Mar. 3, 1958.

873,644.—**Automotive Products Co., Ltd.**—"Operating systems for the flying controls of aircraft."—Oct. 15, 1959. (Oct. 16, 1958.)

873,632.—**E. Bass.**—"Arresting gear for aircraft."—Jan. 3, 1958. (Jan. 28, 1957.)

873,640.—**Aircraft Materials, Ltd.**—"Dereefing and/or release device for parachutes.—Sept. 8, 1959. (Jne. 12, 1958.) (Cognate application 19,866, Jne. 20, 1958.)

873,501.—**Air-Equipment.**—"Gear boxes for driving accessories in aircraft."—May 14, 1958. (May 17, 1957.)

Printed specifications of the above will be available on Jly. 26, 1961, and the opposition period will expire on Oct. 26, 1961.

Recommended Reading

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"THE AEROPLANE Pictorial Review": No. 5. 128 pages. Ill. 12s. 6d. net. (By post 13s. 7d.)

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"Camera in the Sky": By Charles Sims. 224 pages. Ill. 25s. net. (By post 26s. 6d.)

"Principles of Helicopter Engineering": By J. Shapiro. 448 pages. Ill. 55s. net. (By post 56s. 9d.)

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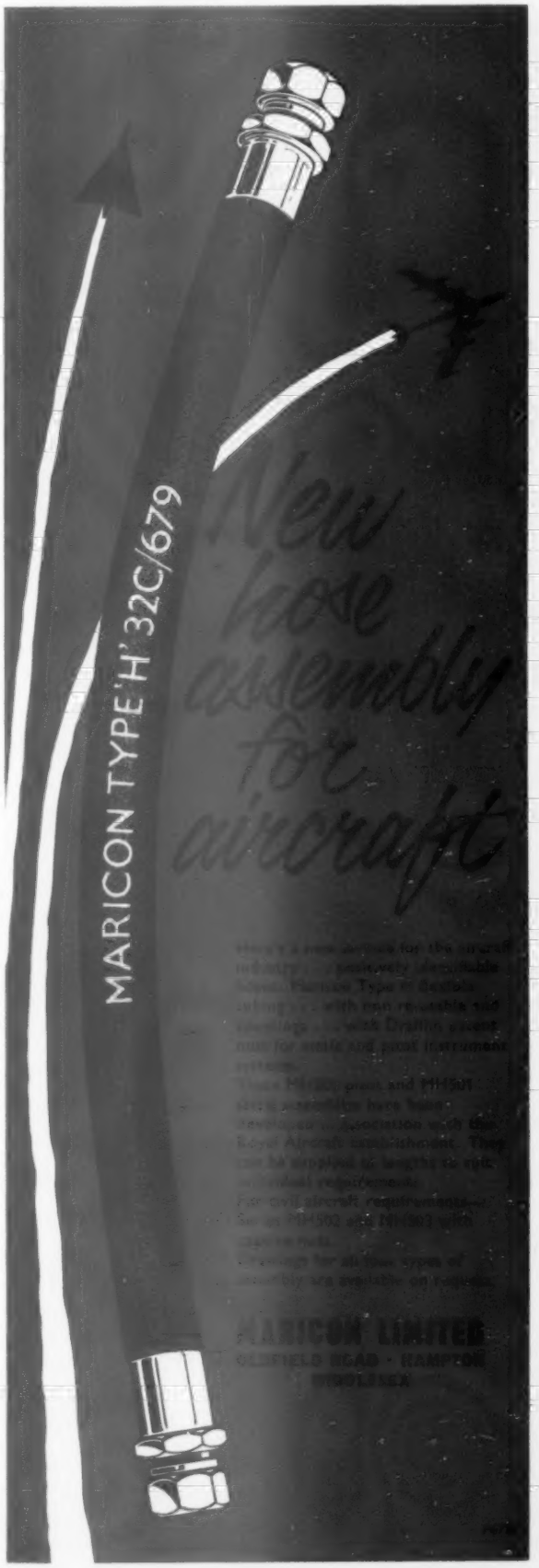

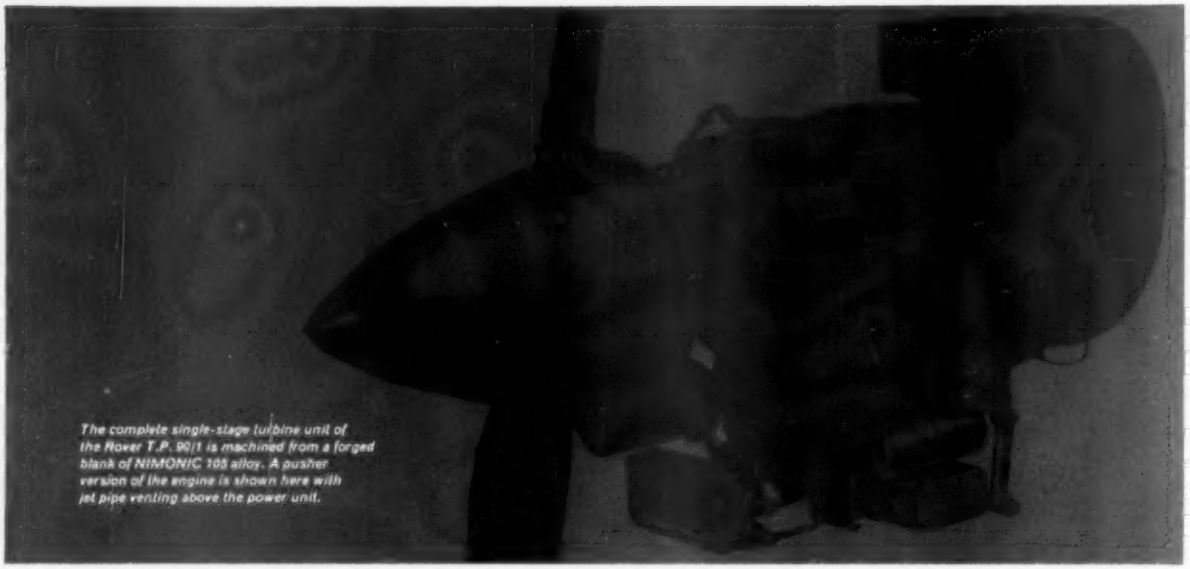

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